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RECORD OF DECISION
OPERABLE UNIT #4
FLOODPLAINS/WETLANDS AREA
FIELDS BROOK SITE, ASHTABULA OHIO

OUTLINE

FIGURES:

TABLES:

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Fields Brook Site, Operable Unit IV, Floodplains/Wetlands Area, Ashtabula, Ohio

STATEMENT OF BASIS AND PURPOSE

This decision document represents the selected Final Remedial Action for the Fields Brook Site, Operable Unit IV (Floodplains/Wetlands Area), in Ashtabula, Ohio. This action was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, with the National Oil and Hazardous Substances Contingency Plan (NCP). The decisions contained herein are based on information contained in the administrative record for this site.

The State of Ohio does not concur with the selected remedy. The non-concurrence letter is attached to this Declaration.

ASSESSMENT OF THE REMEDY

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This remedy is intended to be the final action for Operable Unit IV (Floodplains/Wetlands Area, "FWA") of this site. This final action includes excavation and on-site containment of contaminated soils and sediments; backfilling and revegetation in the FWA; installing a cover in certain areas of the FWA; removal of trees; operation and maintenance and post closure care of the cover and containment facility; imposition of institutional controls; and future monitoring. This final action addresses the migration pathways of incidental ingestion of FWA soil and sediments and dermal absorption of contaminants in FWA soil and sediments.

The major components of the selected remedy include:

- Excavation or cover of contaminated soils and sediments in the FWA that exceed cleanup action levels; backfill of all excavation and cover areas with hydric-compatible soils;

- Removal of all trees in excavation areas, and removal of all trees below 12" diameter at basal height (dbh) in cover areas, with vegetation in response areas considered contaminated, and with live vegetation above ground surface considered clean if it can be decontaminated;

- Revegetation of all backfill and cover areas, and revegetation of all areas disturbed during construction, using erosion mats and native vegetation;

- Construction of a temporary access road to allow access to and along the FWA from the roadways during construction, made of crushed stone and 1/4-inch thick geonet liner, and to be removed after construction and disposed of either in the on-site landfill or if clean in other on-site or off-site areas;

- Consolidation of excavated soils and sediments, construction debris, and roadways constructed to implement the remedy if determined to be contaminated, within an on-site fenced-in containment cell (landfill) to be built on one of the industrial properties located within the Fields Brook watershed;

- Construction of a minimum of three downgradient wells and one upgradient well to monitor the long-term effectiveness of the landfill;

- Long term operation and maintenance and post closure care of the remedial action to help ensure its effectiveness;

- Long term monitoring including sampling of FWA surface soils and sediments, and backfill and cover areas, and monitoring of wetland conditions at specific locations and for parameters defined in the Record of Decision Summary, to verify the effectiveness of the remedial action;

- Placement of institutional controls on deeds and title for properties where: contamination will remain in the FWA; the landfill will be constructed; or hazardous substances, pollutants or contaminants will remain above levels that allow for unlimited use and unrestricted exposure. For the landfill, the deed restrictions must prevent residential, industrial or other development on the landfill. For all other properties, the deed restrictions must provide notice to any subsequent purchaser or prospective developer of the presence of hazardous substances and of the requirement to conduct all development activities in such a manner as to not release contamination towards Fields Brook; and

- Implementation of access restrictions, including enclosing the entire landfill area with a fence and posted warning signs.

STATUTORY DETERMINATIONS

This final Remedial Action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements and is cost-effective. The selected remedial action utilizes permanent solutions and considered use of alternative treatment technologies to the maximum extent practicable. However, due to the significant volume and heterogeneous distribution of waste at the Site, treatment as a principle element is not considered practicable at the Site. Thus, this remedy does not address the statutory preference for treatment that reduces toxicity, mobility, or volume as a principal element. However, treatment is a secondary element in that landfill leachate liquids will be collected and treated resulting in destruction of hazardous substances.

A review of the remedy will be conducted five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

June 30, 1997
Date

David A. Ullrich
David A. Ullrich
Acting Regional Administrator

OhioEPA

State of Ohio Environmental Protection Agency

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June 10, 1997

RE: Fields Brook Superfund Site
Floodplain/Wetland Area
Ohio EPA ID# 204-0300
Ashtabula County

Valdas V. Adamkus
Regional Director
USEPA Region V
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Adamkus:

This letter is in response to the Record of Decision (ROD) for the floodplain / wetland area operable unit (FWA) of the Fields Brook Superfund Site in Ashtabula County, Ohio.

The State of Ohio has expressed concerns about the selected remedy for the FWA in comment letters and in technical meetings with USEPA. Our concerns are included as part of Attachment 1 to the ROD (Responsiveness Summary for the FWA). This letter contains comments from the natural resource trustees (Ohio EPA, U.S. Dept. of the Interior and NOAA) on the 11/96 Proposed Plan for the FWA. Our major concerns are over the protectiveness and permanence of the selected remedy.

USEPA 's selected remedy would remove PCB contaminated soils above the 50 mg/kg isocontour in the occupational exposure units and would remove soils above the 30 mg/kg isocontour in the residential exposure units. Areas in the residential units between 6 and 30 mg/kg would be covered with 6 inches of hydric compatible soil. Ohio EPA recommended that the FWA soils be excavated to lower concentration isocontours in both occupational and residential areas and that the cover remedy be replaced with excavation. We would prefer that the removal goals fall within the 1 to 10 mg/kg range for residential areas and 10 to 25 mg/kg range in occupational areas that has been traditionally used for PCB cleanups. We recognize that this would substantially increase the cost of the remedy and result in greater short term damage to the FWA however it would provide a more protective and permanent remedy for human health and the environment.

Ohio EPA does not believe that the cover remedy in the residential area will be either adequately protective or permanent. A limited soil cover will be susceptible to damage by human activity, burrowing animals, erosion, freeze/thaw and other biological and physical processes. We continue to disagree with the exposure frequencies USEPA used to calculate the cleanup goals (CUGs). USEPA assumed that, in the residential area, exposure frequency to FWA soils would be 61 days/yr for children, 110 days/yr for adolescents and 37 days/yr for adults over a 30 year period. We do not feel that these exposure frequencies are sufficiently protective for areas of the FWA that are directly behind residences and feel that 270 days/yr for all ages is a reasonably conservative exposure frequency that takes into account inclement weather conditions.

In an effort to reduce duplication of agency efforts on Superfund Sites, Ohio EPA, in 1996, relinquished its role as an active participant in the technical review and comment process for the Fields Brook Site and thus left it toUSEPA to negotiate an acceptable remedy with the Fields Brook Action Group (FBAG). Our role after that was as a trustee of natural resources. As such we have provided comments along with the other trustees. The trustee group attempted to negotiate changes to the remedy with FBAG during the past year but were unable to persuade FBAG to make any changes to the remedy. Instead we reached an agreement in principle for a financial settlement with FBAG to compensate the trustees for past and future injuries to the natural resources. The FBAG agreed to fund the aquisition and enhancement of wetlands and some future biological monitoring to assess continuing damages and, we hope, to measure some improvement over time.

Our final effort to affect changes to the remedy came in the form of comments the trustees provided to USEPA during the public comment period for the Proposed Plan (Attachment 1). USEPA offers responses to each of our comments but does not propose to make any changes to the remedy. In view of this and for all of the reasons stated in this letter and in the trustee comments, Ohio EPA does not concur with the ROD for the Fields Brook FWA operable unit.

Please feel free to contact Ohio EPA should you have any questions or concerns regarding this letter.

Sincerely,

Donald R. Schregardus
Director
Ohio Environmental Protection Agency

DRS/RSW.wmk

cc: Jenny Tiell, Deputy Director, CO
Jan Carlson, DERR, CO
Mike Czeczele, DERR, CO
Ray Beaumier, DERR, CO
Bill Skowronski, District Chief, NEDO
Bob Wysenski, Assistant District Chief, NEDO
Rod Beals, DERR, NEDO
Steve Love, DERR, NEDO
Sig Williams, DERR, NEDO
Heidi Sorin, DERR, CO
Jeff Hurdley, Legal, CO
Peter Whitehouse, DERR, CO
Vanessa Steigerwald, DERR, CO
Tim Kern, Ohio AGO

RECORD OF DECISION SUMMARY
FLOODPLAINS/WETLANDS AREA
FIELDS BROOK SITE, ASHTABULA OHIO

I. SITE NAME, LOCATION, AND DESCRIPTION

The Fields Brook site is located in northeast Ohio, in Ashtabula County, approximately 55 miles east of Cleveland, Ohio. The brook drains a six square-mile watershed including an industrial area where manufacturing activities ranging from metal-fabrication to chemical production have occurred over the past 50 years. Sediments of the brook and the Ashtabula River are contaminated with polychlorinated biphenyls (PCBs), chlorinated benzene compounds, chlorinated solvents, hexachlorobutadiene, polyaromatic hydrocarbons (PAHs), arsenic, and other hazardous substances.

The Fields Brook Site (Site) was placed on the National Priorities List (NPL) for hazardous waste sites on September 8, 1983. The site consists of Fields Brook, its tributaries, and any surrounding areas which contribute, potentially may contribute, or have contributed to the contamination of the brook and its tributaries. The site is a multi-source site and involves multiple media, including soil, sediment, groundwater and surface water.

The U.S. EPA divided the site into four areas of concern, three of which have been designated as "operable units" (OUs) associated with the Fields Brook Superfund site (See Figure 1). The Sediment OU (OU#1) involves the cleanup of contaminated sediment in Fields Brook and its tributaries. The Source Control OU (OU#2) involves the location and cleanup of sources of contamination to Fields Brook to prevent recontamination of the brook and Floodplains/Wetlands Area (FWA). The Ashtabula River Area of Concern involves determining the type and amount of contamination in the Ashtabula River, the effect the Fields Brook and other contamination sources have had on the river sediments, and any risks to human health and the environment. The FWA OU (OU#4) involves the cleanup of contaminated soils and sediments in the FWA which are located within the 100-year floodplain area surrounding Fields Brook and outside of the channel and sideslope areas of Fields Brook. The FWA is the subject of this Record of Decision document.

The FWA has been divided geographically into distinct but continuous portions. In order to facilitate locating features and sampling points along Fields Brook and its tributaries, the stream and system has been divided into segments identified by a unique numbering system involving stream reaches, which are depicted on Figure 2. The eastern portion of the Fields Brook watershed drains Ashtabula Township and the western portion drains the eastern portion of the city of Ashtabula. The main channel is 3.9 miles in length and begins at Cook Road, just south of the Penn Central Railroad tracks. From this point, Fields Brook flows northwest to Middle Road, then west to its confluence with the Ashtabula River. From Cook Road downstream to State Route 11, Fields Brook flows through an industrialized area. Downstream of State Route 11 to near its confluence with the Ashtabula River, Fields Brook flows through undeveloped and residential areas in the City of Ashtabula. Fields Brook discharges to the Ashtabula River approximately 8,000 feet upstream from Lake Erie. The City of Ashtabula has a population of about 23,000.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The industrial zone of Ashtabula is concentrated around Fields Brook and is comprised of several chemical industries and waste disposal sites. Manufacturing has occurred since the early 1940's in this area. Activities ranging from metal-fabrication to production of complex chemical products occurred on approximately 18 separate industrial properties, and the decades of industrial activity along Fields Brook and its tributaries resulted in the release of chemical contamination to the Fields Brook watershed, particularly the sediments of Fields Brook, the FWA soils and sediments, and the soils surrounding the industries. These media are contaminated with PCBs, chlorinated benzene compounds, chlorinated ethenes (solvents), hexachlorobutadiene, chromium, arsenic, and other organic and inorganic contaminants.

Between April 1983 and July 1986, a Remedial Investigation/ Feasibility Study (RI/FS) was conducted on the Fields Brook Sediment OU by the U.S. EPA. The 1986 RI/FS included a baseline human health risk assessment which demonstrated human health risks not only for exposure to the brook sediment, but also exposure in the FWA. The U.S. EPA issued a Record of Decision (ROD) in September 1986 detailing a cleanup remedy that U.S. EPA, with the concurrence of Ohio Environmental Protection Agency (OEPA), determined to be necessary for the Fields Brook sediments. The 1986 ROD consists of the following components: excavation, treatment and disposal of sediment from Fields Brook, an RI/FS to identify current sources of contamination to the brook and to develop ways to stop further contamination, and an investigation to address the nature and extent of contamination in the Ashtabula River and Harbor.

In late 1986, the U.S. EPA began negotiating with a number of Potentially Responsible Parties (PRPs) to conduct the source control OU#2 RI/FS activities and sediment operable unit design activities. The PRPs are comprised of the companies who are considered the owners and operators of the chemical industries and waste disposal sites surrounding Fields Brook. The PRPs also include the companies who, by contract, agreement, or other means, either accepted, or arranged for transport, disposal or treatment of, hazardous substances within the Fields Brook site.

The PRPs initiated a voluntary assessment of the nature and extent of contamination in the FWA of the Fields Brook riparian corridor. Field activities were initiated in Spring of 1993. Following an extended comment period on the original ecological risk assessment work plan, the U.S. EPA prepared a separate ecological risk assessment work plan for the Fields Brook FWA in March, 1994. Significant portions of this work plan were incorporated into the PRPs work plan. Three rounds of FWA soil sampling, additional flora and biota sampling and field investigations, and a wetland survey which identified the size and location of wetlands that could be affected by the Fields Brook cleanup, were completed by the spring of 1995.

The PRPs prepared and submitted to U.S. EPA an initial draft baseline ecological risk assessment report in June of 1994. Following U.S. EPA review and comment, the PRPs submitted a second draft of the ecological risk assessment in June of 1995, and upon revision, submitted a third draft in October, 1995. To produce a more acceptable assessment of potential risk to ecological receptors at the site, U.S. EPA prepared a separate ecological risk assessment report in February of 1995. Results of these efforts are discussed within U.S. EPA's October 1996 Ecological Risk Assessment.

U.S. EPA prepared separate baseline Ecological and Human Health Risk Assessments for the FWA in 1996. The PRPs voluntarily conducted an RI/FS for the Fields Brook FWA, and have prepared a FWA Feasibility Study under U.S. EPA oversight. These studies assess human and ecological risks and cleanup alternatives and form the basis for cleanup decisions in the wetland areas. These reports have been placed in the information repositories for this site. These reports are the primary documents in the FWA OU#4 administrative record which were used to develop and issue the Proposed Plan for the FWA in November 1996.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Various public meetings and availability sessions have been held by U.S. EPA in Ashtabula between 1984 and the present to discuss the general progress of the ongoing Fields Brook site investigations.

U.S. EPA has provided regular updates of Fields Brook site activities to the Ashtabula River Remedial Action Plan (RAP) Advisory Council at the monthly RAP meetings in Ashtabula.

On May 26-27, 1993, U.S. EPA conducted several availability sessions and a public meeting in Ashtabula to update the public regarding activities for all four areas of concern, including the FWA, of the Fields Brook Site. After the meeting, U.S. EPA provided the RAP Council and interested citizens with a written response to comments and questions raised at the various meetings.

On September 26, 1996, U.S. EPA conducted another public availability session in Ashtabula, and provided the public with a detailed update regarding the various FWA studies, risk issues and cleanup alternatives being considered to be conducted. In November 1996, U.S. EPA provided the public with a written 'question and answer' response to comments and questions raised at the September meeting.

U.S. EPA issued a Proposed Plan for the FWA in November 1996. U.S. EPA provided a public comment period on the FWA Proposed Plan from November 13, 1996 through January 17, 1997, and conducted an evening public meeting on the FWA Proposed Plan on November 21, 1996 in Ashtabula. Also, U.S. EPA met with officials from the City, Township, and County of Ashtabula on November 21, 1996 prior to the evening public meeting and provided these officials with a status update regarding the Fields Brook site and the FWA. U.S. EPA's response to the public comments received are summarized in the attached Responsiveness Summary, which is Attachment 1 of this Record of Decision. This ROD will become part of the Administrative Record pursuant to the NCP Section 300.825 (a)(2). The Administrative Record can be found at the Site repositories located at:

1) Ashtabula County District Library
   335 West 44th Street
   Ashtabula, OH

2) U.S. Environmental Protection Agency
   Waste Management Division Records Center, 7th Floor
   77 West Jackson Blvd.
   Chicago, IL

IV. SUMMARY OF SITE CHARACTERISTICS

A) Overview:

The FWA consists of the 100-year floodplain of Fields Brook. As reported in *The Soil Survey of Ashtabula County, Ohio*, published by the U.S. Department of Agriculture Soil Conservation Service, much of the FWA has a natural subsurface composed of glacial deposits overlying bedrock. Bedrock surfaces in various locations in the lower reaches of Fields Brook (generally from Route 11 down to the Ashtabula River), and surface glacial and Fields Brook sediment depositional soils occur frequently across the entire FWA. In the upper reaches of Fields Brook (upstream of State Street), depth of bedrock approaches approximately 30 to 40 feet. The bedrock is primarily shale with an upper sandstone unit approximately 3 feet thick. The bedrock is generally not considered a favorable source of groundwater because of its low permeability, low porosity, and relatively low yields (less than 3 gpm).

The groundwater in the FWA generally flows towards and discharges into Fields Brook. In general, Fields Brook is a 'receiving stream', meaning that it receives groundwater from the surrounding areas including the FWA. Because the soils and silts in the FWA are generally of very slow permeability and poor natural drainage, the speed of groundwater within the FWA soils is generally very slow (1 to 3 feet/year). The combination of low hydraulic conductivity and relatively slow groundwater migration has generally prevented people and industries from using the groundwater in the area, and has prevented contaminants from entering the groundwater and flowing to Fields Brook via groundwater.

The FWA soils mostly do not drain well (i.e., not much infiltration of rainwater occurs), and the soils are essentially flat at the surface without hills. The FWA soils are comprised of either geologically lake-deposited or recent brook-deposited sediment, and exhibit seasonal wetness and low permeability. The upper 5 to 15 feet of unconsolidated materials generally consist of lacustrine silty clay to clayey and sandy silt with rounded gravel and some silty sand, with variable amounts of organic matter. Glacial till (Ashtabula Till) underlies the lacustrine deposits; the Ashtabula till is composed of hard clayey to sandy silts with angular gravel and rock fragments. A common soil type in the FWA is the Holly silt loam. These FWA soils generally have a 4"-6" thick leaf litter, and are covered with native grasses, brush, shrubs and hardwood trees. Fragmites weeds frequently cover the soils throughout the FWA.

The FWA area in the downstream reaches of Fields Brook (in the residential home areas, from Route 11 down to the Ashtabula River) generally is surrounded by a relatively flat floodplain area, which spreads out in variable distances from the brook to the 100-year floodplain edge. In these downstream areas, the FWA is generally significantly lower topographically from the homes (between 15-30 feet lower than backyard areas near homes) and is frequently covered with dense brush and bushes.

A wetland survey, which identified the size and location of wetlands that could be affected by the Fields Brook cleanups, and an extensive wetland sampling effort, were completed in the fall 1995. Data from these efforts were included in the October 1996 FWA Remedial Investigation report. Baseline Ecological and Baseline Human Health Risk Assessments of the FWA were also completed by the U.S. EPA in October 1996, and are provided as separate reports. The PRPs voluntarily conducted an RI/FS for the Fields Brook FWA, and prepared an October 1996 FWA Feasibility Study under U.S. EPA oversight. The FWA FS is provided as a separate report. These studies assess human and ecological risks in these areas and form the basis for cleanup decisions in the wetland areas.

B) FWA Exposure Units

For risk assessment purposes, reaches of the brook were segregated into FWA exposure units (FEU). These FEUs are indicated on Figure 2. The State of Ohio, U.S. EPA and the PRPs discussed and agreed on the appropriate size of the FWA exposure units. Each of the FEUs are approximately 2,000 feet in length, and correspond to areas where potential exposure to FWA soils would occur by distinct groups of people on each side of the brook. Various factors were considered in determining the size of the exposure units, including review of survey data, discussions with local citizens, inspection of all FWA areas, investigations of plants and animals along the FWA, and evidence of use along the FWA. The U.S. EPA has reviewed these lengths and concluded that after cleanup activities the average of the Cleanup Goals (CUGs) for each FEU would be protective of human health and the environment.

Land use designation for the FEUs were based upon several considerations: 1) general homogeneity with respect to historical waste management activities, 2) differences in land use, terrain, accessibility or media type which can affect exposure scenarios, and 3) U.S. EPA Guidance documents. It is understood that some FEUs may not have floodplains or wetlands but are set up only to retain a consistent numbering system with the sediment FEUs. The grouping of FEUs and their associated land use designation follows.

- **Residential:**
  - FEU1 Reach 1
  - FEU2 Reach 2-1, 2-2, and part of 9
  - FEU3 Reach 3

- **Industrial:**
  - FEU4 Reach 4
  - FEU5 Reach 11-1 and 11-2
  - FEU6 Reach 5-1 and 5-2
  - FEU7 Reach 11-3 and 11-4
  - FEU8 Reach 6 and 7-1
  - FEU9 Reach 7-2 and 8-1
  - FEU10 Reach 8-2, 8-3, 8A, 13-1, 13-2, and 13A

Only five of the FEUs contain floodplain soils, or contain chemical concentrations above the CUGs. These are FEU2, FEU3, FEU4, FEU6 and FEU8. FEUs 2 and 3 are considered residential based upon the presence of homes on the property. The industrial FEUs are upstream of the residential FEUs. There are no fences along the FWA, and fences do not separate the residential from the industrial exposure units.

FEU4, FEU6 and FEU8 are considered to have industrial usage for the following reasons: a) the area east of Route 11 currently does not have residential development; b) the properties that fall within FEU4 and FEU6 primarily belong to the industry or the City of Ashtabula, and do not belong to private land owners; and c) the properties can be permanently restricted from residential development through deed restrictions and covenants.

The other five FEUs were eliminated from further consideration for several reasons. FEUs 1, 5 and 7 do not have a floodplain area (i.e., Fields Brook, during a 100 year storm, stays within the brook channel and does not overflow the banks in these FEU's). In FEUs 9 and 10, sampling results indicated no exceedences in the FWA above the CUGs.

C) Summary of Sampling Data

Since 1985, sampling has been done to quantify the levels of contaminants in the FWA. The FWA soil analytical results presented in various data reports have been sent to the information repositories, and represent sampling efforts primarily performed by the PRP's that have taken place in the FWA during the past five years. Some of the soils data were collected as part of the brook sampling programs. Additional surface soil samples were collected at selected locations within the FWA investigation area to fill data gaps. Surface soil sampling locations were selected by reviewing existing brook sediment sampling data and by locating the sampling points in areas of expected deposition. Sampling locations are shown on Figures 3 through 7 in the 10/96 U.S. EPA FWA RI Report.

Tissue samples were also collected from mice, shrews, earthworms, voles, insects, and vegetation and analyzed for 130 separate chemical parameters. Results of these efforts are discussed in U.S. EPA's October 1996 Ecological Risk Assessment. PCBs were observed in the FWA biota. A maximum concentration of 11 ppm total PCBs was detected in a single shrew composite sample. However, most concentrations were well below this level ranging from 0.029 to 4.8 ppm. Arsenic, cadmium, chromium, lead, and hexachlorobenzene were observed in all tissue matrices throughout the FWA. Barium, vanadium, and hexachlorobutadiene were observed in several but not all matrices. Various chemicals of concern, including several trace metals (lead, cadmium, chromium, vanadium, and barium), were considered in the ecological risk assessment. PCBs, hexachlorobenzene, and hexachlorobutadiene were the organics that were fully assessed in the ecological risk assessment. Others were eliminated because their levels were not high enough in the FWA to be of concern to organisms. Summaries of the biota species collected, biota potentially present, vegetation identified, wildlife observed, and flora and fauna sampling data are summarized in Tables 2 through 5 of U.S. EPA's 10/96 FWA Ecological Assessment Report.

D) Soil Sampling Data Summary

A total of 211 FWA soil samples were taken. As part of the Phase I Sediment Quantification Design Investigation (SQDI) sampling, 14 sampling locations were randomly selected to provide a general characterization of site conditions adjacent to the brook. During Phase II SQDI, 55 sampling locations were located along transects perpendicular to the Fields Brook channel. Transects were located near Phase I SQDI sediment sampling locations that reported elevated concentrations of COC's. During the Phase III FWA assessment, the 137 sampling locations were located within each FEU to represent a statistically valid number of samples. In general, a total of 40 samples were collected within each of the five exposure units with CUG exceedences: FEU2, FEU3, FEU4, FEU6 and FEU8. The sampling locations were spread fairly evenly along each length of the FWA with an equal number of samples (twenty) on the north and south sides of the main channel. The sampling locations also included collecting approximately fifteen 'cross-sections' of the FWA during sampling. This effort located three sampling locations evenly spaced on each side of the brook perpendicular to the brook from the brook to the edge of the FWA. Subsurface soil sampling (samples collected from the one foot depth below the surface to the two foot depth below the surface) occurred along five of the FWA cross sections where the brook sediment data indicated the highest levels of contamination in the sediment.

The Phase I and Phase II FWA soil samples, taken as part of the SQDI, were analyzed for approximately 130 different chemicals (i.e., the TCL and TAL parameters). The 137 Phase III FWA soil samples were analyzed for eleven chemicals of concern (COCs) which exceeded cleanup goals in the brook sediment; these eleven COCs were: arsenic, benzo(a)pyrene, beryllium, hexachlorobenzene, hexachlorobutadiene, hexachloroethane, PCBs, 1,1,2,2,-tetrachloroethane, tetrachloroethene, trichloroethene, and vinyl chloride. The soil sampling locations were located by a registered surveyor.

Soil sampling showed 95 hazardous substances which were detected in some or all portions of the FWA. As would be expected based on the site's history, volatile and semi-volatile organic chemicals, pesticides, PCBs, and inorganic chemicals were detected in the FWA soils. It was found that levels of contamination in the FWA soil did not exceed the level of contamination in the brook sediment.

The physical-chemical properties of the contaminants detected in Fields Brook affect their fate in the environment. Hydrophobic organic compounds, like PCB's, are especially persistent in the environment due to their low solubility in water, high octanol-water partition coefficients, and high molecular weights. These organic compounds accumulate into the fatty tissue of organisms and will be passed on through the higher orders of the food chain.

The COC concentrations vary from background and nondetect levels to several hundred parts per million (ppm or mg/kg). Maximum concentrations for some of the semivolatile organics were: 610 mg/kg for total PCB (FEU 6), 480 mg/kg for hexachlorobenzene (FEU 8), 170 mg/kg for hexachlorobutadiene (FEU 4); for some of the volatile organics: 56 mg/kg for trichloroethene (FEU 6), 89 mg/kg for tetrachloroethene (FEU 6), and 8.5 mg/kg for vinyl chloride (FEU 6); and for some of the trace metals: 43 mg/kg for arsenic (FEU 8) and 57.7 mg/kg for mercury (along the Detrex Tributary to Fields Brook). Average and upper confidence limit concentrations and their frequency of detection for all of the chemicals of concern in FWA soils are summarized in the attached Tables 1-1 through 1-5, and are also provided in Appendix A of U.S. EPA's 10/96 FWA RI Report. All detected levels within FWA soils for all of the chemicals of concern are summarized in Appendix B of U.S. EPA's 10/96 FWA RI Report.

The concentrations of all COCs except beryllium, vinyl chloride, trichloroethene and 1,1,2,2-tetrachloroethane were determined to be generally equivalent on the north and south sides of the brook. Beryllium concentrations were statistically different on the north and south sides of the brook. The average concentration on the north was 1.86 mg/kg, with a maximum detected concentration of 19.4 mg/kg, whereas the average concentration on the south was 0.7 mg/kg, with a maximum detected concentration of 2.3 mg/kg.

Although there appears to be somewhat more beryllium in the FWA on the north side of FEU6 and 8 than on the south side, calculated risks for beryllium are quite low and beryllium is not a determinant for remediation in either FEU. Vinyl chloride is rarely detected and influences neither risks nor remediation. Similarly, trichloroethene is somewhat more prevalent on the south side of FEU2, and 1,1,2,2-tetrachloroethane is somewhat more prevalent on the south side of FEU3, but calculated risks for trichloroethene in FEU2 and 1,1,2,2-tetrachloroethane in FEU3 are extremely low, on the order of 10^{-10}. In conclusion, the statistical tests indicate that for those COCs that influence risks and remediation needs, there is no substantial difference in concentration levels on the north and south sides of Fields Brook.

E) Summary of Soils Data for FEU 2

The most frequently observed organic compounds in FEU 2 were polynuclear aromatic hydrocarbons (PAHs), PCBs (primarily Aroclor 1248), bis-2-ethylhexylphthalate, dibenzofuran, hexachlorobenzene, hexachloro-butadiene, di-n-butylphthalate, acetone, methylene chloride, tetrachloroethene and toluene. The highest detected concentration of total PCBs was 360 mg/kg, with the average concentration at 24.2 mg/kg. The highest and average detected concentration of hexachlorobenzene were 97 and 14.3 mg/kg, respectively, and the average hexachlorobutadiene concentration was 0.81 mg/kg. The maximum detected concentrations of the following inorganic COCs exceeded the sediment background concentration established for the Sediment Operable Unit (SOU): arsenic, beryllium, cadmium, chromium, lead, and mercury.

Vinyl chloride was not detected in any of the 22 samples collected on the north side of the brook and was detected in 1 of the 22 samples collected on the south side of the brook. Therefore, vinyl chloride concentrations were statistically different on the north and south sides. In addition, trichloroethene concentrations were also found to differ between the north and south sides; the maximum detected concentrations on the north and south were 0.15 mg/kg and 6.8 mg/kg, respectively. The concentrations of all other COCs were determined to be generally equivalent on the north and south sides of the brook.

F) Summary of Soils Data for FEU 3

The most frequently observed organic compounds in FEU 3 were PAHs, PCBs (primarily Aroclor 1248), di-n-butylphthalate, bis-2-ethylhexylphthalate, methylene chloride, tetrachloroethene, and hexachloro-benzene. The highest detected concentration of total PCBs was 530 mg/kg, with the average concentration at 29 mg/kg. The highest and average detected concentrations of hexachlorobenzene were 99 and 6.4 mg/kg, respectively, and the average concentration of hexachlorobutadiene was 2.8 mg/kg. The maximum detected concentrations of the following inorganic COCs exceeded the sediment background concentration established for the SOU: arsenic, beryllium, cadmium, chromium, and mercury.

1,1,2,2-Tetrachloroethane concentrations were statistically different on the north and south sides of the brook. The maximum detected concentrations on the north and south were 0.022 mg/kg and 0.22 mg/kg, respectively. The concentrations of all other COCs were determined to be generally equivalent on the north and south sides of the brook.

G) Summary of Soils Data for FEU 4

The most frequently observed organic compounds in FEU 4 were PAHs, PCBs (primarily Aroclor 1248), 1,2-dichloroethene, 1,2,4-trichlorobenzene, 1,1,2,2-tetrachloroethane, acetone, 2-butanone, tetrachloroethene, trichloroethene, bis-2(ethylhexyl)phthalate, di-n-butylphthalate, hexachlorobenzene and hexachlorobutadiene. The highest detected concentration of total PCBs was 560 mg/kg, with the average concentration at 63 mg/kg. The highest and average detected concentrations of hexachlorobenzene were 230 and

29 mg/kg, respectively, and the average concentration of hexachlorobutadiene was 9.2 mg/kg. The maximum detected concentrations of the following inorganic COCs exceeded the sediment background concentration established for the SOU: arsenic, beryllium, cadmium, chromium, lead, and mercury.

The concentrations of all COCs were determined to be generally equivalent on the north and south sides of the brook.

H) Summary of Soils Data for FEU 6

The most frequently observed organic compounds in FEU 6 were PAHs, PCBs (primarily Aroclor 1248), 1,1,2,2-tetrachloroethane, 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,2-dichloroethene, 1,2-dichlorobenzene, bis-2-ethylhexylphthalate, methylene chloride, acetone, tetrachloroethene, trichloroethene, and xylenes. The highest detected concentration of total PCBs was 610 mg/kg, with the average concentration at 76 mg/kg. The highest and average detected concentrations of hexachlorobenzene were 320 and 33 mg/kg, respectively, and the average concentration of hexachlorobutadiene was 11 mg/kg. The maximum detected concentrations of the following inorganic COCs exceeded the sediment background concentration established for the SOU: arsenic, beryllium, cadmium, chromium, lead, and mercury.

Beryllium concentrations were statistically different on the north and south sides of the brook. The average concentration on the north was 1.36 mg/kg, with a maximum detected concentration of 6 mg/kg, whereas the average concentration on the south was 0.6 mg/kg, with a maximum detected concentration of 2.2 mg/kg. The concentrations of all other COCs were determined to be generally equivalent on the north and south sides of the brook.

Radionuclide sampling occurred on the RMI Extrusion property which lies within FEU6. In 1985, the RMI Titanium Company Extrusion Plant conducted an extensive baseline characterization study to determine uranium levels in soil in the vicinity of the plant. As part of the 1985 sampling campaign, eleven samples were taken in the Fields Brook floodplain. As a result of the 1985 baseline characterization, several locations, including three floodplain locations were selected for annual resampling. Also, additional radionuclide data were collected on the RMI Extrusion facility as part of RMI's decommissioning efforts. 74 FWA samples were taken within floodplain areas behind RMI-Extrusion for Uranium isotopes U-234 and U-235, and for Technetium-99; 132 FWA samples were taken behind RMI-Extrusion for U-238. The results are summarized in the 12/95 and 9/30/96 RMI reports which have been provided in the Fields Brook Site Administrative Record. There were several individual sampling point detections of total uranium radionuclides in FWA areas, ranging up to 110 picocuries per gram (Pci/g).

I) Summary of Soils Data for FEU 8

The most frequently observed organic compounds in FEU 8 were PAHs, PCBs (primarily Aroclor 1248), dimethyl-phthalate, diethylphthalate, butylbenzylphthalate, bis-2-ethylhexylphthalate, carbazole, dibenzofuran, 1,2-dichloroethene, 1,1,2,2-tetrachloroethane, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, trichloroethene, tetrachloroethene, 2-butanone, hexachlorobenzene, hexachloroethane and hexachlorobutadiene. The highest detected concentration of total PCBs was 270 mg/kg, with the average concentration at 34 mg/kg. The highest and average detected concentrations of hexachlorobenzene were 480 and 30 mg/kg, respectively, and the average concentration of hexachlorobutadiene was 1.2 mg/kg. The maximum detected concentrations of the following inorganic COCs exceeded the sediment background concentrations established for the SOU: arsenic, berylliûm, cadmium, chromium, lead, and mercury. The concentrations of all COCs were determined to be generally equivalent on the north and south sides of the brook.

V. HUMAN HEALTH RISK ASSESSMENT

Based on analytical data collected during the FWA remedial investigation, a risk assessment was performed to determine the potential risks to human health posed by the contaminants detected in the FWA soils and sediments. The risk assessment is a baseline risk assessment and assumes that no corrective action will take place in the FWA, and that no site-use restrictions or institutional controls such as fencing or construction restrictions will be imposed. The FWA human health risk assessment determines the actual or potential carcinogenic risks and/or toxic effects that chemicals detected in the FWA pose under current and future land use assumptions.

A) Chemicals of Concern

U.S. EPA's October 1996 Fields Brook FWA Human Health Risk Assessment focused on 11 chemicals of concern (COC) which were the 11 COCs which exceeded any of the Fields Brook sediment operable unit cleanup goals (CUGs) on average for any sediment exposure unit. The Fields Brook Sediment Operable Unit CUGs are outlined in U.S. EPA's August 3, 1993 and August 18, 1993 letters to Mr. Joseph Heimbuch of de maximus, Inc., and the CUG exceedences are described in the February 1995 30% design document (these letters and the 30% design document are in the Fields Brook Site Administrative Record). These COC are indicated in Table 3 and include arsenic, benzo(a)-pyrene, beryllium, 1,1,2,2,-tetrachloroethane, tetrachloroethene, trichloroethene, hexachloroethane, vinyl chloride, hexachlorobenzene, hexachlorobutadiene, and PCBs. Hexachloroethane and vinyl chloride were screened out as COCs in the U.S. EPA 1996 FWA human health risk assessment because they were detected at a frequency of less than 5 percent. The FWA human health risk assessment focused on the 11 COC which exceeded the sediment cleanup concentration goals which were determined during the Fields Brook sediment remedial design. The FWA COC, their detection frequency and detected concentrations are presented for each FEU in Tables 1-1 through 1-5.

B) Exposure Assessment

An exposure assessment was conducted as part of the human health risk assessment. The potential risks to people exposed to the FWA include risks from ingestion of soils in the FWA, inhalation of dusts from the area, dermal exposure to the soils, and gardening in the FWA. The greatest potential risks to people are from ingestion of soils in the FWA. U.S. EPA's review of these risks indicate that if risks from ingestion of soil are addressed, the other risks to humans and the environment would also be addressed.

Current and future land use was divided between residential (in FEUs 2 and 3) and commercial/industrial (in FEUs 4, 6, and 8) as part of the exposure assessment. U.S. EPA's development of the CUGs assumed that people would be exposed at certain frequencies in the residential and industrial areas. In the residential area, U.S. EPA assumed that someone would ingest between 50 and 200 milligrams of surface soils 61 days per year for children, 110 days/year for adolescents and 37 days per year for adults, for a total of thirty years. In the industrial area, U.S. EPA assumed that someone would ingest 50 milligrams of surface soils 60 days per year for a total of twenty five years.

U.S. EPA's review of the information regarding exposure to FWA soils indicate that frequent exposure to FWA soils is not likely. There are six months or more of the year which involve cold weather in Ashtabula, which tends to inhibit outdoor exposure to soils. The FWA does not have any buildings or structures, in part because structures are prohibited from being built within the FWA because of regular flooding. This lack of building should lessen the likelihood of human exposure in the FWA. Also, the FWA is generally different than the immediate backyard lawn areas of the homes along the brook. The FWA is topographically lower than the grassy backyard areas (i.e., 10-20 feet lower in height than the lawn areas) and is frequently separated from the backyard lawn areas by brush, bushes with burrs and other obstacles making it difficult to reach the FWA directly from the homes.

U.S. EPA's research indicates that subsurface exposure below one foot of soil depth in residential and FWA backyards generally does not occur unless erosion or excavation was expected in that area (which is not expected to occur). Also, of the 23 deep soil samples taken between one-to-two feet from the surface in the FWA, only two samples indicated levels of any contamination above the CUGs. These two locations are in the FWA soils between Columbus Avenue and East 16th Street. The levels of contamination at these locations are only slightly above the CUGs.

Plants growing in the FWA, including vegetables grown in the FWA, generally do not pick up organic contamination such as PCBs and HCBs. According to scientific studies, this is because their roots generally do not absorb these contaminants. Leafy trees such as willows and poplars, and leafy vegetables such as spinach, cabbage or lettuce which might be grown in the FWA, may pick up heavy metals such as cadmium, chromium and mercury which exist in the FWA. However, these metals are generally not prevalent in FWA soils at elevated levels. Thus, plants were not considered media containing hazardous substances of concern. However, roots and vegetative materials growing in areas of FWA soil contamination may be considered contaminated in part because the contaminated soil particles may be inseparable from the roots and vegetative materials.

C) Human Health Risk Assessment

The total potential carcinogenic and noncarcinogenic hazard quotients are presented in Table 6 of the U.S. EPA 1996 FWA human health risk assessment. The calculation spreadsheets, which provide additional detail to the individual and overall contaminant risk profiles, are found in Appendix D of the U.S. EPA 1996 FWA human health risk assessment.

The total potential carcinogenic risk associated within each FEU is greater than the 10^{-6} risk which is considered the departure point for acceptable risk by U.S. EPA. The potential excess cancer risks ranged from 1.6×10^{-3} (at FEU 3) to 1.2×10^{-4} (at FEU 8). Exposure to PCBs and hexachlorobenzene, both Class B2 carcinogens, contributed the majority of the excess cancer risk. There is not likely to be a short term risk to anyone walking along the brook in the FWA. However, there is a calculable cancer risk to residents, workers, and trespassers due primarily to long-term exposures through ingestion of soils and contaminants in the FWA soils and brook sediments.

In FEU2, FEU3, FEU4 and FEU6, the hazard indices (HI) are greater than one, indicating that adverse health effects may occur from exposure to the site. The hazard indices range from 25 in FEU 3 (due primarily to potential exposures to PCBs) to 1.6 in FEU 8 (due to potential exposures to the same contaminant). These values reflect addition of all the HI's in a given FEU regardless of the chemical-specific endpoint. Thus, these numbers are likely to overestimate the non-carcinogenic negative impacts from chemicals at the Site.

A cancer survey was conducted by the Ohio Department of Health in June 1987 to assess whether there was any evidence of increased incidence of cancer to residents who live or lived along Fields Brook due to potential exposures to contaminants which have been released from companies along the brook. This survey was not able to detect statistically significant increases of cancer to the population within close proximity to Fields Brook when compared to the total cancer levels indicated for the State of Ohio and for the United States. However, within that normal cancer rate, the incidence of brain and central nervous system cancer was higher than expected compared to both Ohio and the United States levels. The study also noted that it was not known if potential exposures by these individuals to Fields Brook area contamination played a role in these increased incidences. A detailed follow-up investigation into these cases was conducted by the Ohio Department of Health in June 1988 and that report is also included in the information repository. This follow-up study noted that the increased incidences had an unknown cause, possibly due to a misclassification of the primary disease, environmental factors, or chance alone.

The two major risk drivers at the Fields Brook site are PCBs and HCB. Risk from these two contaminants account for all of the additive risk at the site. Beryllium and tetrachloroethene contribute a risk in the 10^{-6} range in FEU's 2 and 3 and FEU6 respectively. Both PCB and HCB have carcinogenic and non-carcinogenic effects. In addition, both PCB and HCB have been shown to affect the developing fetus, indicating that the hazard indices for these two chemicals can be appropriately added.

PCBs encompass a class of chlorinated compounds which includes up to 209 variations, or congeners, with different physical and chemical characteristics. Specific combinations of PCB congeners are generally unique to each site. PCB congeners are grouped into categories of PCBs which are known as Aroclors. Certain Aroclors are commonly associated with insulation systems, others used in hydraulic, lubricating and heat transfer fluids, and still others as dielectric fluids in transformers. These three types of Aroclors were used within the Fields Brook site. It was agreed upon by both U.S. EPA and the PRPs during meetings in 1994 and 1995 to consider all of the Aroclor's and congeners together as total PCBs in the risk assessment. The FWA human health risk assessment has calculated the PCB risk using the cancer slope factor of 7.7 $(mg/kg\text{-}day)^{-1}$, which was used throughout previous risk assessment drafts and discussions between U.S. EPA and the PRPs. The human health risk assessment also calculated risks using the recently revised and current cancer slope factor of 2.0 $(mg/kg\text{-}day)^{-1}$ which was entered onto the Integrated Risk Information System (IRIS) October 1, 1996. Both of these calculations were reported in the human health risk assessment because the timing for the slope factor revision was unknown when the risk assessment was drafted in the summer of 1996.

Regarding radionuclides, U.S. EPA's October 1996 Fields Brook FWA Human Health Risk Assessments provides the Radionuclide CUGs (RCUGs) which U.S. EPA established for both the Fields Brook sediment and the FWA soils and sediments. The RCUG concentrations were conservatively calculated assuming both alpha and gamma emissions, and the exposure routes used in the development of the RCUGs were incidental ingestion and external exposure to direct gamma. U.S. EPA compared all of the radionuclide data taken on the RMI Extrusion facility and FWA to the RCUGs. Of the 74 U-234, U-235, and Technetium-99 FWA samples, there were no U-234 and Technetium-99 RCUG exceedences, and there were two U-235 RCUG exceedences (these two U-235 RCUG exceedences were within the FWA areas behind RMI which have been fenced-in for a number of years). Of the 132 U-238 FWA samples behind the RMI-Extrusion facility, there were 10 U-238 RCUG exceedences, with seven exceedences within FWA areas behind RMI which have been fenced-in for a number of years, and three RCUG exceedences within FWA areas behind RMI which have been recently fenced-in.

U.S. EPA's review of the data indicate that radionuclides, and in particular Uranium, are not considered a chemical of concern within the FWA because the levels of U-235 and U-238 indicated in the FWA area were relatively low. The average levels indicated on the RMI-Extrusion property, and within each residential and industrial FEU including FEU6 which includes the RMI Extrusion facility, were below the RCUGs established for U-235 and U-238 by the U.S. EPA (i.e., the soil levels within the FWA are below the $1x10^{-6}$ risk levels). The Agency for Toxic Substances and Disease Registry also indicated in its 4/96 health assessment for the RMI-Extrusion property (copy provided in the Fields Brook site Administrative Record) that the radionuclide levels indicated on the property do not pose a significant risk to human health.

Also, to be protective, RMI-Extrusion has recently fenced-in all areas of RCUG exceedences on its property, installed silt fences in the downgradient areas of detected radionuclides to catch suspended silt which may run off the property during rainstorms, and is also planning to excavate/remove the contaminated soils in their backyard, including the RCUG exceedence FWA soil areas, and ship the soil to an approved storage facility in either Utah or Nevada. The excavation activities are planned to occur in 1998, and will be conducted in coordination with the ongoing facility decontamination and decommissioning actions being conducted under supervision of the U.S. Department of Energy. The excavation actions will also include delineation sampling in 1997 prior to the beginning of excavation to ensure that the extent of the RCUG exceedence areas have been defined.

VI. ECOLOGICAL RISK ASSESSMENT

U.S. EPA prepared an October 1996 Ecological Risk Assessment Report which evaluated risks associated with doses of contaminants to ecological receptors by comparing receptors against reference doses to calculate hazard quotients (HQs). Various chemicals of concern (COC) were identified, as indicated in Table 3, and the ecological risk assessment focused on barium, cadmium, chromium, lead, mercury, vanadium, hexachlorobenzene, hexachlorobutadiene, and PCBs. The FWA COC, their detection frequency and detected concentrations are presented for each FEU in Tables 1-1 through 1-5. The HQs are presented for all species and zones in Tables 5-1 through 5-3 in the ecological risk assessment for exposures using: 1) mean media concentrations and area use factors (AUFs) as presented; 2) 95 percent upper confidence limit (UCL) concentrations and AUFs as presented; and 3) 95 percent upper confidence limit on the mean (UCLM) concentrations and AUFs set equal to 1.0, respectively. Using this information, along with originally determined toxicity reference values (TRVs), HQs were calculated for each ecological receptor, COC, and Zone (including reference or "background" locations) when sufficient information existed to do so. Results based on original calculations are presented within the ecological risk assessment. As indicated on these tables, a number of different receptors of concern including mink, hawk, shrew, mouse, heron, robin and rabbit have HQs which exceed 1 for multiple contaminants of concern.

VII. SCOPE OF THE SELECTED REMEDY

The purpose of this Record of Decision (ROD) is to select the final remedial action for the Fields Brook Site FWA. This final remedy contains or removes the contaminated soils and sediments from the FWA through a combination of excavating with backfilling and landfilling, or covering the contaminated soils. All excavated materials will be contained on-site in a lined landfill, and all cover and excavation areas will include removal of trees and revegetation with native vegetation. Operation and maintenance, post closure care and future monitoring will occur, and institutional controls and access restrictions will be placed.

The remedy addresses all exposures to media and releases to migration pathways that are considered to present an unacceptable risk, including incidental ingestion of soil and dermal absorption of contaminants in soil, and releases to surface water, ground water, surface sediments, and wetlands.

This remedy does not include treatment of principle threat wastes in order to reduce toxicity, mobility, or volume of the contamination. As discussed in greater detail later in this ROD, treatment is not practicable in part because of the significant volume of the waste, the contaminated FWA soils will be non-mobile, the low average concentration of the materials in place and to be excavated, and there are no residential or industrial FWA exposure units which have principle threat concentrations of contaminants on average greater than a 10^{-4} cancer risk for the FWA. However, treatment is a secondary element in that landfill leachate liquids if they are generated will be collected and treated resulting in destruction of hazardous substances.

VIII. DESCRIPTION OF ALTERNATIVES:

A) Overview and Discussion:

The FS identified and evaluated alternatives that addressed threats and potential threats to human health and the environment posed by the COCs in the FWA. These remedial alternatives have several common components including site preparation, placement of institutional controls, and surface controls (such as soil erosion control and revegetation of excavation and cover areas and areas of disturbance).

The cleanup objectives for contaminants in the FWA are to conduct a cleanup which would be protective of human health and the environment. Each alternative evaluated in the FS and listed and discussed in this ROD other than the no action alternative involves excavation and/or containment of FWA contamination. The extent of excavation and/or cover activities varies between the different alternatives. Each alternative attempts to meet the cleanup objectives by conducting a cleanup which would result in residual FWA contamination levels which are at or below the cleanup goals (CUGs) on average in each FEU on each side of the brook. The CUGs for each of the FWA contaminants are listed in Tables 2-1 through 2-4 of this ROD, and are based in part on a human health risk associated with $1x10^{-6}$ range for carcinogens and a less than one hazard index. This FWA CUG list is taken from EPA's 10/20/94 CUG letter to the PRPs, and is also attached to U.S. EPA's 1996 FWA Human Health Risk Assessment. The only exception to this CUG list are the CUGs for total PCBs in the residential and industrial areas of the FWA, which have been to 1 ppm on average in residential areas and 6 to 8 ppm on average in industrial areas.

Also, each of the alternatives evaluated in the FS segregated sections of the FWA into FWA exposure units (FEU). These FEUs are indicated on Figure 2. The State of Ohio, U.S. EPA and the PRPs discussed and agreed on the appropriate size of the FWA exposure units. Each of the FEUs are approximately 2,000 feet in length, and correspond to areas where potential exposure to FWA soils would occur by distinct groups of people on each side of the brook. Various factors were considered in determining the size of the exposure units, including review of survey data, discussions with local citizens, inspection of all FWA areas, investigations of plants and animals along the FWA, and evidence of use along the FWA. The U.S. EPA has reviewed these lengths and concluded that after cleanup activities the average of the CUGs in each FEU on each side of the brook would be protective of human health and the environment.

A remedial approach which is directed at PCB and HCB would effectively address the primary risk at the site and would also remove other COCs in the FWA. This is due to several reasons: a) the dominant risk in the FWA to both human and ecological receptors is from PCB and HCB; b) the significant levels of all other COCs exist where elevated levels of PCBs and HCB exist, as indicated in part by the 12/11/96 "FWA Delineation Sampling Maps" deliverable from Woodward Clyde which has been included in the Administrative Record; and c) based on a review of the data, U.S. EPA has found that if a remedial cleanup to the HCB and PCB FWA CUGs on average throughout each exposure unit occurs, the low levels of all other contamination and other COCs remaining in the FWA after cleanup is completed would be protective of human health and the environment for each exposure unit.

To help demonstrate that the response areas are properly defined, all of the remedial alternatives except no action would have delineation sampling conducted in each FWA exposure unit prior to the beginning of construction to ensure that the response areas are properly defined to meet the remedial action objective for that remedial alternative. Also, all of the excavation and cover alternatives include the following activities: a) long term operation and maintenance and post closure care of the remedial action to help ensure its effectiveness; b) long term monitoring including sampling of FWA surface soils and sediments, the backfill and cover areas, and monitoring of wetland conditions at specific locations and for various parameters to verify the effectiveness of the remedial action; and c) compliance determinations to be made with floodway/floodplain regulations with compensation for loss or damage to wetlands. All of the alternatives, including the no-action alternative, include imposition of deed restrictions and access restrictions over the Site property.

Regarding the cover alternatives, U.S. EPA investigated several potential ways that contaminants could reach the surface of a six inch soil cover. These include movement to the surface by earthworms, burrowing animals, and by other mechanisms. U.S. EPA has reviewed these mechanisms and has determined that if the lower levels of contaminants present in the residential area are covered, it is not likely that these contaminants would reach the soil surface at levels of concern to humans.

Whenever excavation or cover of contaminated soils and sediments in the FWA is considered, backfill of all excavation or cover areas would occur using hydric-compatible soils. These are soils that contain seeds, organics and other properties necessary for vegetative regrowth in the wet environment. Also, removal of all trees in excavation areas, and removal of all trees below 12" diameter at basal height (dbh) in cover areas, would occur, with roots in response areas considered contaminated, and with vegetation above ground surface considered clean if it can be decontaminated. Revegetation of all backfill and cover areas, and revegetation of all areas disturbed during construction, would occur using erosion mats and native vegetation.

Based on sampling data available, the alternatives other than no action consider excavation and/or covering of volumes between 8,000 and 27,000 cubic yards of FWA soils. Additional investigation to define the extent of PCB contamination in every 2,500 square feet of the FWA downgradient or downstream from the furthest upstream FWA area requiring remediation in FEU8 will be conducted for each of the alternatives other than no-action, and additional investigation to define the extent of HCB contamination in FEU's 4 and 8 will be needed due to elevated HCB sampling results in these areas, prior to the beginning of construction to help define the extent of soil excavation and cover areas.

In addition, Alternative 7 includes additional design delineation investigation activities and enhanced long term monitoring.

The alternatives other than no action will also involve construction of a temporary access road to allow access to and along the FWA areas from the roadways during construction. The roads will be made of crushed stone and 1/4-inch thick geonet liner. The temporary road will be removed after construction and disposed of either in the landfill or if clean as uncontaminated solid waste. If the road is considered clean, the crushed stone may be used if appropriate to assist in the construction of FWA remedy components, including construction of the landfill.

B) Alternative Listing

The alternatives evaluated in the FS are presented below:

Alternative 1 - No Action

- Estimated Present Worth Cost: $0
- Estimated Construction Time: Immediate

The inclusion of the no action alternative is required by law and gives U.S. EPA a basis for comparison. This alternative will not reduce any potential public health or environmental risks currently associated with the Site. This alternative does not include any institutional controls over the use of ground water or surface water.

Alternative 2 - Containment-Hydric-Compatible Soil Cover

- Estimated Total Present Worth Cost: $4,600,000
- Estimated Cover Cost, Present Worth: $140,000
- Estimated O&M Cost, 1 year Present Worth: $244,000
- Estimated Construction Time: 12 months

This alternative consists of site preparation, institutional controls, revegetation, and the placement of a hydric-compatible soil cover and erosion mat over the Response Areas which exceed 10^{-6} remedial risk objectives in the residential areas, and 10^{-5} remedial risk objectives in the industrial areas. The soil cover thickness would vary from 6 to 12 inches. Physical inspections and chemical sampling would be part of long-term monitoring. Wetlands mitigation at off-Site locations is also considered.

Alternative 3A -Hydric-Compatible Soil Cover, Excavation, Backfill and Off-Site Disposal

- Estimated Present Worth Cost: $8,900,000
- Estimated Construction Time: 12 months
- Estimated Cover Cost, Present Worth: $196,000
- Estimated O&M Cost, 1 year Present Worth: $244,000

This alternative consists of site preparation, institutional controls, revegetation, and the placement of a hydric-compatible soil cover and erosion mat over the Response Areas. Specifically, this alternative would excavate, remove and backfill soils above 30 ppm total PCBs in FEUs 2 and 3, and above 250 ppm total PCBs in FEUs 4, 6 and 8, and place soil cover over soils above 6 ppm total PCBs in FEUs 2 and 3, and above 50 ppm total PCBs in FEUs 4, 6 and 8. Excavation would be limited to 12 inches. Excavated soil would be disposed of at an off-Site landfill. Physical inspections and chemical sampling would be part of long-term monitoring. Wetlands mitigation at off-Site locations is also considered. Approximately 8,000 cubic yards will be excavated and removed from the FWA under this alternative, and brought to an off-site disposal facility.

Alternative 3B- Hydric-Compatible Soil Cover, Excavation, Backfill and Off-Site Disposal

- Estimated Present Worth Cost: $9,500,000
- Estimated Construction Time: 12 months
- Estimated Cover Cost, Present Worth: $285,000
- Estimated O&M Cost, 1 year Present Worth: $244,000

This alternative is similar to Alternative 3A except the Response Areas were adjusted to require additional excavation near residential areas. Specifically, this alternative would excavate, remove and backfill soils above 30 ppm total PCBs in FEUs 2 and 3, and above 400 ppm total PCBs in FEUs 4, 6 and 8, and place soil cover over soils above 8 ppm total PCBs in FEUs 2 and 3, and above 50 ppm total PCBs in FEUs 4, 6 and 8. Excavation would be limited to 12 inches. Excavated soil would be disposed of at an off-Site landfill. Physical inspections and chemical sampling would be part of long-term monitoring. Wetlands mitigation at off-Site locations is also considered. Approximately 9,300 cubic yards will be excavated and removed from the FWA under this alternative, and brought to an off-site disposal facility.

Alternative 4 - Hydric-Compatible Soil Cover

- Estimated Present Worth Cost: $5,800,000
- Estimated Construction Time: 12 months
- Estimated Cover Cost, Present Worth: $285,000
- Estimated O&M Cost, 1 year Present Worth: $244,000

This alternative is similar to Alternative 2, except the soil cover and erosion protection mat would be placed over a larger Response Area than Alternative 2. Specifically, cover would be placed over the Response Areas which exceed 10^{-6} remedial risk objectives in both the residential and industrial FWA areas. Physical inspections and chemical sampling would be part of long-term monitoring. Wetlands mitigation at off-Site locations is also considered.

Alternative 5 - Excavation, Backfill, and Off-Site Disposal

- Estimated Present Worth Cost: $19,000,000
- Estimated Constriction Time: 12 months
- Estimated Cover Cost, Present Worth: $569,000
- Estimated O&M Cost, 1 year Present Worth: $73,000

This alternative consists of site preparation, institutional controls, revegetation, excavating, and backfilling with hydric-compatible soils over Response Areas. Excavation would be limited to 12 inches. Specifically, this alternative would excavate, remove and backfill soils from FWA Response Areas which exceed 10^{-6} remedial risk objectives in both the residential and industrial FWA areas. Physical inspection and chemical sampling would be part of long-term monitoring. Wetlands mitigation at off-Site locations is also considered. Approximately 28,500 cubic yards will be excavated and removed from the FWA under this alternative, and brought to an off-site disposal facility.

Alternative 6 - Excavation, Backfill, Thermal Treatment of PCB-Contaminated Soil, and Off-Site Disposal

- Estimated Present Worth Cost: $21,300,000
- Estimated Construction Time: 12 months

- Estimated Cover Cost, Present Worth: $569,000
- Estimated O&M Cost, 1 year Present Worth: $73,000

This alternative is similar to Alternative 5, except that, in lieu of off-Site landfilling, excavated material exceeding 500 mg/kg PCBs would be transported off-Site for thermal treatment. Specifically, this alternative would excavate, remove and backfill soils from FWA Response Areas which exceed 10^{-6} remedial risk objectives in both the residential and industrial FWA areas. Physical inspections and chemical sampling would be part of long-term monitoring. Wetlands mitigation at off-Site locations is also considered. Approximately 28,500 cubic yards will be excavated and removed from the FWA under this alternative, and brought to an off-site disposal facility.

Alternative 7 - Hydric-Compatible Soil Cover, Excavation, Backfill, and On-Site Disposal

- Estimated Present Worth Cost: $6,900,000
- Estimated Construction Time: 12 months
- Estimated Cover Cost, Present Worth: $60,000
- Estimated O&M Cost, 1 year Present Worth: $111,000

This alternative consists of site preparation, institutional controls, revegetation, excavation and backfill, and the placement of a hydric-compatible soil cover and erosion mat over Response Areas. Specifically, this alternative would excavate, remove and backfill soils above 30 ppm total PCBs in FEUs 2 and 3, and above 50 ppm total PCBs in FEUs 4, 6 and 8, and place soil cover over soils above 6 ppm total PCBs in FEUs 2 and 3. Excavation would be limited to 12 inches. Excavated soil would be disposed of at an on-Site landfill located at a selected industrial facility within the Fields Brook Site. Wetlands mitigation at off-Site locations is also considered. In addition to excavation and backfill activities, a 6-inch soil cover would be placed over all soil areas with PCB contamination of 6 ppm to 30 ppm in FEU2 and FEU3. Physical inspections and chemical sampling will be conducted as a part of long-term monitoring to help ensure that the cleanup activities in both of these areas remain protective of human health and the environment. Approximately 15,300 cubic yards will be excavated and removed from the FWA under this alternative, and brought to an on-site landfill.

IX. SUMMARY OF COMPARATIVE EVALUATION OF ALTERNATIVES

The National Contingency Plan (NCP) requires that the alternatives be evaluated on the basis of the following nine evaluation criteria: (1) Overall protection of human health and the environment; (2) Compliance with applicable or relevant and appropriate requirements (ARARs); (3) Long-term effectiveness and permanence; (4) Reduction of toxicity, mobility, or volume through treatment; (5) Short-term effectiveness; (6) Implementability; (7) Cost; (8) State acceptance; and (9) Community acceptance. This section compares the alternatives with regard to these nine evaluation criteria.

A) THRESHOLD CRITERIA: OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT AND COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS):

Alternative 1, the No Action Alternative, would result in unacceptable risks under current conditions due to the detrimental impacts on human and ecological receptors which may be occurring under current conditions.

Alternatives 2, 3A, 3B, and 4 include either a cover alternative solely involving 6 to 12 inches of soil cover, or limited FWA soils and sediment excavation with cover alternatives involving 6 to 12 inches of soil cover, which may cause a detrimental impact to the wetland ecology and ecological receptors. These alternatives may not be protective because they may result in unacceptable risks to humans in the event that the higher concentration contaminants reach the cover surfaces over time. These alternatives also would not comply with the TSCA disposal regulations. Therefore, Alternatives 2, 3A, 3B, and 4 are eliminated from further consideration.

Of the remaining alternatives, all are protective of human health and the environment. Alternatives 5, 6 and 7 all provide a similar level of significant risk reduction and involve a greater degree of excavation and removal of FWA soils than the other alternatives. Over the long term, Alternatives 5, 6 and 7 would be more protective, effective and permanent.

Excavation alternatives, in general, meet the protectiveness objectives regarding exposure to chemicals in FWA soil and sediment. While excavation completely removes chemicals from the soil column, it generally destroys the habitat in place. Although some wetland communities (those dominated by annual grasses or herbaceous vegetation) can be effectively restored in a relatively short time period, others (dominated by woody species) cannot be restored in a relatively short period. The ecological value of the latter is generally high, and destruction of such habitats has negative impacts. Much of the Fields Brook FWA is wooded. Over much of the area, excavation techniques will result in destruction of valuable habitat.

Clean cover reduces the potential for chemicals to be exposed to humans and to the bioaccessible and bioavailable pools. Alternatives providing 6 inches and 12 inches of cover would offer reduction in ecological exposure. Long-term reduction of ecological exposure depends in part on the long-term integrity of the cover.

As discussed previously, plants growing in the FWA, including vegetables grown in the FWA, generally do not pick up organic contamination such as PCBs and HCBs, and are not generally considered media containing hazardous substances of concern. However, roots and vegetative materials growing in areas of FWA soil contamination planned for remedial activity may be considered contaminated in part because the contaminated soil particles may be closely associated with and inseparable from the roots and vegetative materials.

Under the 6-inch and 12-inch cover options, while potential for exposure is reduced, chemicals will remain in the potential exposure pool. Twelve-inch covers offer greater margin of safety for long-term protection, but may be likely to stress most trees, and a number may be killed by reduced oxygen ration. In addition, the wetland character of the FWA would likely be degraded, and substantial areas of wetland may be lost as a result of placing a 12-inch cover. Effects from a 6-inch cover would be less severe. Transition communities or even communities expressing primarily upland character are likely to occur more readily on a 12-inch cover, and thus the habitat may change over time. A 6-inch cover is unlikely to stress woody vegetation. Understory, shrub and herb layer communities are likely to re-establish in largely their present configurations, although some wetland character may be lost. Such losses may be minimal, however, because the existing FWA has relatively substantial elevation differences relative to water table, and wetland vegetation is pervasive.

Cover technologies would be most-suitable for areas with relatively low levels of contamination, in part because of the uncertainty associated with the surfacing of COCs. With cover in place, the biologically active surface soil and litter layers will develop and function. In the ecosystems of the FWA, cover technologies placed over areas with relatively low levels of contamination would offer adequate exposure reduction for ecological receptors with less habitat destruction than excavation. A well designed, installed, and maintained cover would provide long-term protection for ecological receptors.

During construction activities there is a possibility that there could be releases of contaminants to the air above acceptable limits which assure protection of human health and the environment. Air monitoring during construction activities in the FWA and brook sediment areas will be conducted to help assure that no unacceptable levels of air contaminants are released during the cleanup. The levels will be compared to short-term industry standards to ensure protectiveness, as well as to long-term calculated levels. If any unacceptable releases are found, cleanup activities would immediately be adjusted to prevent unacceptable releases of air contaminants.

The potential for recontamination of Fields Brook sediment from releases of any residual FWA soil contamination after FWA remediation occurs is expected to be low, particularly for the excavation alternatives, for several reasons. Because the FWA CUGs are lower than the brook sediment CUGs, the FWA soils after remediation will have lower average residual concentrations of contaminants than the residual average concentrations in brook sediment, and would thus not be likely to cause recontamination. Also, the 8/94 sediment scour analysis conducted during the brook sediment remedial design indicates that floodplain soils would not be expected to erode from hydraulic scour during a 100-year rainstorm. Further, the 5/95 "FWA Field Reconnaissance and Photo Documentation Report" indicates that the FWA is (and would likely remain) flat and well covered with leaves, shrubs and vegetation which would help prevent releases of contamination. The scour and reconnaissance reports are available for review in the information repositories. Lastly, post-remediation monitoring and operation and maintenance inspections will help ensure that the surfacing of elevated levels of FWA contamination would not occur.

All of the alternatives except no action include a number of common actions that are necessary to address site risks or to achieve ARARs, including the following:

1. Site access restrictions;

2. Institutional controls;

3. Additional investigation;

4. Long term monitoring;

5. Remediation of contaminated FWA soils and sediments;

6. Compliance with floodway/floodplain regulations; and

7. Compensation for loss or damage to wetlands.

The ARARs for these remedial actions are indicated in Tables 4-1 and 4-2, and include in part the following:

- surface water quality standards, including the NPDES program (Clean Water Act Section 402, 40 CFR 122, 123, 125, 131 Pretreatment Regulations (40 CFR 403), The State of Ohio NPDES requirements (OAC 3745-33), the State of Ohio Water Quality Standards (OAC 3745-1); and the State of Ohio Pretreatment Rules (3745-3);

- actions to minimize the destruction, loss, or degradation of wetlands in Executive Order 11988 and 40 CFR 6, Appendix A Section 6(a)(5);

- air limits to be met on-site during the cleanup activities, including limits set by OSHA (29 CFR 1910); NAAQS (40 CFR 50); various other sections of the Clean Air Act (and various federal air regulations) between 40 CFR 1 to 99: and various OEPA standards, including Ambient Air Standards (OAC 3745-17-02A,B,C); Control of Visible Particulate Emissions (OAC 3734.02(I)); and other State of Ohio requirements;

- regulations and restrictions on construction within floodways and floodplains, including Permits for Discharges of Dredged or Fill Materials (33 CFR 320 to 330, Sections 401 and 404 of the CWA): and Protection of Floodplains (40 CFR 6, Appendix A):

- TSCA disposal regulations at 40 C.F.R. § 761.60 et seq., are applicable to PCBs in concentrations of 50 ppm or greater (PCBs) when such PCBs are "taken out of service". Under the remedial actions being considered, TSCA disposal regulations could be triggered by excavation of PCBs which may occur during the excavation of sediments and soils. Pursuant to 40 C.F.R. § 761.60(a)(4), PCBs must be disposed of: "(i) in an incinerator which complies with 761.70; or (ii) in a chemical waste landfill which complies with 761.75." The TSCA compliant chemical waste landfill disposal method is generally much less expensive than incineration.

Alternatives 5, 6 and 7 would all be consistent with the ARARs indicated on Tables 4-1 and 4-2, particularly the OEPA requirements for disposal of solid waste and TSCA requirements for disposal of regulated PCB soils and solid waste.

B) PRIMARY BALANCING CRITERIA: LONG-TERM EFFECTIVENESS AND PERMANENCE; REDUCTION OF TOXICITY, MOBILITY AND VOLUME THROUGH TREATMENT; SHORT-TERM EFFECTIVENESS; IMPLEMENTABILITY; AND COST.

Alternatives 5, 6 and 7 provide for increased long-term effectiveness and permanence because they include the removal of soil from areas of highest contamination concentration in the FWA, and the covering of these areas of high contamination may not be permanent nor effective.

None of the alternatives except Alternative 6 include treatment of principle threat wastes in order to reduce toxicity, mobility, or volume of the contamination. Principle threats include wastes which can not be reliably controlled in place such as liquids, highly mobile materials, and high concentrations of toxic compounds. Where treatment technologies are not technically feasible or available within a reasonable timeframe, the extraordinary size or complexity of a site makes implementation of treatment technologies impracticable, or implementation of a treatment-based remedy would result in a greater risk to human health or the environment, treatment may not be practicable. Due in part to the significant volume and heterogeneous distribution of waste at the Site, treatment as a principle element is not considered practicable at the Site.

Also, the contaminated FWA soils will be essentially comprised of non-mobile contamination, because they will be dewatered before disposal and the contaminants within the soils will be non-liquid and adsorbed to soil. The FWA soils were contaminated by deposition of contamination which was flowing in Fields Brook, and is mostly if not totally comprised of contaminated sediments deposited from the brook during large storm events. During 1994 design investigations conducted for the Fields Brook sediment remedy, several leachate samples were taken from untreated sediment samples taken from four sediment locations with the highest detected sediment contamination in the brook downgradient of the major source areas of contamination. The sediment in these areas had elevated levels of PCBs, volatile organics and other contaminants. These leachate samples did not contain any levels which were above hazardous waste levels (i.e., the levels were below the Toxic Characteristic Leachability Procedure (TCLP) levels established under U.S. EPA's RCRA program under 40 CFR 261.24) and thus did not exhibit the characteristic of toxicity. These studies, which are in the information repositories, provide sufficient information that the FWA soils would not require treatment through solidification because they would not be considered hazardous by toxicity characteristic under RCRA, and because the contaminated soils would not be expected to release toxic liquids once landfilled regardless of the volume of leachate produced. Also, once the excavated FWA soils are dewatered and placed into the double-lined landfill without solidification, even if leachate releases did occur, there are a series of measures which will detect, stop and treat such releases in the landfill area before any unacceptable risk to human health of the environmental occurred.

In addition, principle threat wastes generally include wastes with concentrations greater than a 10^{-4} cancer risk at a site, and there are no residential or industrial FWA exposure units which have principle threat concentrations of contaminants on average greater than a 10^{-4} cancer risk for the FWA. The cleanup objectives for contaminants in the FWA include to remove or appropriately contain contamination to levels which for each contaminant which are, on average, at or below the cleanup goals (CUGs). The CUGs for total PCBs in the residential and industrial areas of the FWA are set at 1 ppm in the residential area and 6 to 8 ppm in the industrial FWA areas on each side of the brook in each exposure unit. There are no residential or industrial FWA exposure units which have existing concentrations for any contaminant (including total PCBs) which on average would present greater than a $1x10^{-4}$ human health risk. FWA's 2, 3, 4, 6, and 8 have an average total PCB concentration of approximately 50-60 ppm, and the excavated soils will have a low average concentration of between 100-150 ppm total PCBs. Thus, for these reasons treatment would not be practicable or required.

However, treatment is a secondary element in that landfill leachate liquids, if they are generated, will be collected and treated resulting in destruction of hazardous substances. Thus, if contaminated liquids leach from the landfilled material, these liquids will be collected and treated.

No significant short-term risks nor implementability problems are expected during construction or soon after construction of Alternatives 5 through 7. There may be difficulty in restoring the wetland environment to the preconstruction degree of vegetation, in part because the removal of large trees from any excavation areas and smaller trees from cover areas may change the ecosystem significantly enough that regrowth of the same species may not occur. Alternatives 5 through 7 would also provide for short term effectiveness, in part because the significant areas of contamination within the FWA would be covered or excavated and removed. This would over the short term effectively prevent exposure to significant contamination. Air monitoring will be conducted during construction activities to help assure that no unacceptable levels of air contaminants are released during the cleanup.

Alternatives 5 and 6 are more expensive because they require excavation of all of the contamination present in the FWA above the cleanup goals and the off-Site disposal and/or treatment of these excavated materials. Alternative 7 is estimated to cost between $12 and $14 million less than Alternatives 5 and 6.

C) MODIFYING CRITERIA: STATE AGENCY ACCEPTANCE; COMMUNITY ACCEPTANCE.

The State of Ohio, through OEPA, has had a number of concerns regarding the preferred remedial alternative and its protectiveness of human health and the environment, does not concur with the U.S. EPA preferred alternative, and has stated that substantially more contaminated FWA soils should be excavated from the FWA in order to achieve a more protective remedy for the environment. Specifically, OEPA wanted U.S. EPA to select a variation to Alternative 5 which would remove 13,200 additional cubic yards of lower-level contaminated soils over Alternative 7, at an increased cost of approximately $5.1 million over the $6.9 million cost of Alternative 7. OEPA also felt that the exposure frequencies should have been more conservative than those U.S. EPA used in the FWA human health risk assessment. OEPA wanted additional days/year for the exposure assumptions used in developing the cleanup goals (CUGs) for the FWA. U.S. EPA's development of the CUGs assumed that people would be exposed at certain frequencies in the residential and industrial areas. In the residential area, U.S. EPA assumed that someone would be exposed to FWA surface soils 61 days per year for children, 110 days/year for adolescents and 37 days per year for adults, for a total of thirty years. In the industrial area, U.S. EPA assumed that someone would be exposed to FWA surface soils 60 days per year for a total of twenty five years. OEPA finds that 270 days/yr for ages 0-30 would be appropriate, in part because contamination is located in FWA areas directly behind residences, and in part because only three months of the year have an average daily temperature below 32° F for the Ashtabula area.

U.S. EPA has considered the potential effect of not removing materials below 30 ppm total PCBs in the residential FWA area, and below 50 ppm in the industrial FWA area, and finds that the proposed remedy would be protective of both human health and the environment. The relatively low level of potential increased protectiveness provided by the increased FWA soil excavation desired by OEPA in the above-noted variation of Alternative 5 does not offset the increased costs required to implement this alternative over the cost of Alternative 7 (i.e., $5.1 million increased costs). Alternative 7 offers the best balance between protectiveness and cost effectiveness of all alternatives, including the variation of Alternative 5 described above.

As previously stated, U.S. EPA's review of the information regarding human exposure to FWA soils indicate that frequent exposure to FWA soils is not likely. The cleanup in the FWA soils provided by Alternative 7 will reduce potential cancer risk to approximately one chance in one million after cleanup. These levels are within the overall remedial action objective target risk level (10^{-6}) which is being selected for this remedy.

The highest calculated post-remediation Hazard Quotient ("HQ", which is a term used to assess the potential effects to ecological receptors of concern) was below 5 for Alternative 7, and for most receptors of concern was below 1, for each contaminant within the FWA, as indicated in the 10/96 FWA Feasibility Study, Attachment 1. These levels are within an acceptable range and within an order of magnitude of the acceptable post-remediation objectives U.S. EPA strives to achieve for all ecological cleanups. U.S. EPA believes that the response actions to be conducted as proposed for the FWA soils would protect the various populations of plants and animals which exist or may exist along the floodplain area for this site. Alternative 7 will significantly reduce the short- and long-term risks to ecological populations and reduce these population's potential uptake of contamination via soil and food to acceptable levels of exposure. Also, the additional damage to the wetlands that would occur under the variation to Alternative 5 described above also weighs against this alternative.

U.S. EPA provided a public comment period on the FWA Proposed Plan from November 13, 1996 through December 17, 1996, and conducted a public meeting on the FWA Proposed Plan on November 21, 1996 in Ashtabula. Upon a request received from the U.S. Department of Interior (U.S. DOI) on behalf of the Natural Resource Trustees (i.e., U.S. DOI, the State of Ohio and the National Oceanic and Atmospheric Administration) associated with this site, the public comment period was extended to January 17, 1997. U.S. EPA's response to the public comments received are summarized in the attached Responsiveness Summary, which is Attachment 1 of this Record of Decision.

X. THE SELECTED REMEDY

The selected remedy is Alternative 7, which involves installation of a hydric-compatible soil cover, excavation, backfill, and on-Site disposal of excavated materials. The attached Evaluation Table (Table 5) indicates that Alternative 7 provides the overall best tradeoffs with respect to the nine evaluation criteria. Alternative 7 is the most cost effective alternative which reduces exposure to contaminants by removing the soil with the most elevated concentrations of contaminants from the FWA environment via excavation and on-Site consolidation, and by covering areas of relatively low level contamination. The response areas involving areas with FWA contamination at or above certain PCB and HCB concentrations discussed below are indicated for Alternative 7 in Figures 3 through 8. The exact dimensions and locations of the cover and excavation limits will be developed during the design of U.S. EPA's selected remedial alternative.

Specific requirements of this selected remedy are provided below.

A) Detailed Requirements of the Selected Remedy:

1) Remedial Action Objectives and Cleanup Goals

The remedial action objectives of the selected remedy are to reduce the potential for human health cancer risk to one chance in one million or lower after cleanup, and to reduce the potential for human health non-cancer risks to levels that are no longer considered toxic to humans. The remedial action objectives also are to reduce the potential for ecological risk to levels that would protect the various populations of plants and animals which exist or may exist in the FWA. In addition, the remedial action objectives are to avoid or minimize destructive impacts to the FWA from construction activities and the final remedy to the extent practicable in order to protect the ecological value and existing habitats of the FWA.

The cleanup goals (CUGs) of the selected remedy are the average concentration per FEU for each contaminant of concern within the FWA at which the remedial action objectives noted above would be met and at which exposure by people, plants and animals would be protective. The CUGs are based on a human health risk associated with $1x10^{-6}$ range for carcinogens and hazard index of less than one for non-carcinogens. The CUGs are also within an acceptable range and within an order of magnitude of the acceptable post-remediation objectives U.S. EPA strives to achieve for all ecological cleanups.

The CUGs for each of the FWA contaminants are listed in Tables 2-1 through 2-4 of this ROD. Copies of U.S. EPA's 10/20/94 letter which includes calculations used to develop these CUGs, and copies of U.S. EPA's 1/31/94 letter which indicates Radionuclide Contamination CUGs, are included in U.S. EPA's October 1996 Human Health Risk Assessment report. An explanation of the development of the CUGs is included as an attachment to U.S. EPA's October 1996 Human Health Risk Assessment report.

Regarding ecological risk reduction based on a cleanup to the CUGs, the highest calculated post-remediation Hazard Quotients ("HQ", which is a term used to assess the potential effects to ecological receptors of concern) are below 5 for Alternative 7, and for most receptors of concern are below 1, for each contaminant within the FWA, as indicated in the 10/96 FWA Feasibility Study, Attachment 1. These levels are within an acceptable range and within an order of magnitude of the acceptable post-remediation objectives U.S. EPA strives to achieve for all ecological cleanups. The response actions to be conducted under Alternative 7 would protect the various populations of plants and animals which exist or may exist along the floodplain area for this site and will significantly reduce the short- and long-term risks to ecological populations and reducing these population's potential uptake of contamination via soil and food to acceptable levels of exposure. It should also be noted that the HQ calculations were developed using conservative assumptions which would help provide for protectiveness to ecological receptors.

The only exception to the CUGs listed in Tables 2-1 through 2-4 are the CUGs for total PCBs in the residential and industrial FWA areas. The total PCB CUGs are set at an average of 1 ppm in the residential area and an average of 6 to 8 ppm in the industrial FWA areas on each side of the brook in each exposure unit. Regarding the PCB CUGs, U.S. EPA calculated two separate human health cancer risk CUGs for PCBs in the Human Health Risk Assessment, one set of CUGs based on the revised CSF and one set based on the former CSF. The recently revised and current CSF of 2.0 results in PCB cancer risk CUGs of 1.2 ppm on average in residential areas and 9.6 ppm on average in industrial areas. The former CSF of 7.7 results in PCB cancer risk CUGs of 0.3 ppm on average in residential areas and 2.5 ppm on average in industrial areas. Both of these calculations were reported in the human health risk assessment because the timing for the slope factor revision was unknown when the risk assessment was drafted in the summer of 1996.

Upon consideration of the various issues associated with PCB risks at the Fields Brook site, U.S. EPA has made a risk management decision and has set the total PCB CUGs for the floodplain/wetlands operable unit as follows: 1 ppm on average in residential areas, 6 to 8 ppm on average in industrial areas. These FWA PCB CUGs are slightly lower in concentration than CUGs based solely on the recently revised CSF, and slightly higher than CUGs based solely on the former CSF. These FWA PCB CUGs are based on U.S. EPA's risk management decision to be protective of ecological receptors at the site, and to attempt to be protective and account for the uncertainties regarding the endocrine disrupter health effects. Also, this decision reflects U.S. EPA's attempt to account for the potential synergistic effects of the multiple contaminants in the FWA which may increase health risks associated with the predominant chemical of concern in the FWA, which is/are PCBs.

Regarding the need to be protective of ecological receptors at the site in developing the FWA PCB CUGs, the 1986 FWA Ecological Risk Assessment indicated the potential for significant risks to ecological populations associated with exposure to PCBs. It should be noted that although a FWA remedy which meets the total PCB CUG of 1 ppm on average in residential areas and 6 to 8 ppm on average in industrial areas may still result in chronic hazard quotients (HQs) which exceed a value of 1 for several species (as discussed above), and that HQs above 1 may indicate a risk of adverse effects to species, U.S. EPA believes that a FWA remedy which meets the above noted PCB CUGS would protect the various populations of ecological receptors which exist or may exist within the floodplain area for this site. The response actions would reduce the short- and long-term risks to ecological populations and reduce these population's potential uptake of contamination via soil and food to acceptable levels of exposure.

Regarding the need to attempt to be protective and account for the uncertainties regarding the endocrine disrupter health effects in developing the FWA PCB CUGs, it should be noted that although the PCB cancer risk slope factor changed based on the final reassessment report of September 1996 from 7.7 to 2, as noted within the 1996 Human Health Risk Assessment, at this time there is no agreed-upon quantitative method within U.S. EPA to incorporate the endocrine disruption data into a toxicity value.

There is reason to believe that the endocrine disrupter effect may be the most sensitive health effect of PCB exposure. Also, U.S. EPA's general practice is to err on the side of caution regarding use of uncertain data; the endocrine disruption uncertainties provide justification for the use of a conservative PCB cleanup goal calculation. As endocrine disrupters, PCBs have the potential to negatively impact the developing fetus, increase vulnerability to certain cancers, and possibly decrease fertility. While an RFD has not been calculated based on these endpoints, the current evidence suggests that PCBs have the potential to disrupt the endocrine system.

2) Excavation, Cover, and Disposal Requirements:

a) excavate all soil in residential areas with total PCB contamination above 30 ppm and HCB above 80 ppm, and excavate all soil in industrial areas above 50 ppm total PCBs and over 200 ppm HCBs;

b) cover all soil in residential areas with total PCB contamination between 6-30 ppm PCBs with 6 inches of hydric-compatible soil, and revegetate using erosion mats and native vegetation;

c) transport excavated soils, construction debris, and roadways to a containment cell (landfill) to be built on one of the industrial properties located within the Fields Brook watershed;

d) remove all trees in excavation areas, and all trees below 12-inch diameter in cover areas; regarding the trees to be left standing in cover areas, avoid compaction of the roots and fill to be placed around the trees, and use construction equipment equipped with a retractable boom if feasible so that the equipment stays outside the dripline of the trees; regarding roots, any roots, subsurface vegetative materials, or other vegetative materials downed before remedial activities commenced, which are in response areas or require removal to conduct the remedy will be considered contaminated; any live vegetation above ground surface not contaminated with soils or sediments and which can be adequately spray washed if necessary, may be considered not contaminated, and generally may be mulched, and used for site restoration; and

e) backfill all excavation areas with hydric-compatible soils and revegetate using erosion mats and native vegetation.

3) Landfill Requirements

The on-site landfill to be constructed would be located on one of the industrial properties in the Fields Brook watershed. It would have a bottom liner and would be covered with a plastic liner, clean soil and vegetation. It would be surrounded by a fence with signs posted every 100 feet warning of the presence of hazardous substances, and would have future monitoring and sampling to ensure it remains protective. To assure long-term effectiveness and protectiveness, the landfill would be constructed to meet the following minimum requirements:

a) Bottom Liner (from bottom to top, as indicated in Figure 9):

- choose area where underlying clay is expected to be continuous, sand lenses not known to exist, and ground water not known to be contaminated if possible; grade to level;
- 6-inch thick compacted in-situ clay; the bottom of the clay shall be at least 5 feet above the historical high ground water table
- 60-mil flexible synthetic membrane liner (FML) which has a permeability equivalent or less than $1x10^{-14}$ cm/sec
- 6-inch thick sand/gravel with leachate detection system
- 60-mil FML liner
- 6-inch thick sand/gravel with leachate collection system
- dewatered contaminated soils/sediment (no rocks/sharp materials near bottom)

b) Cover (from bottom to top, as indicated in Figure 9):

- grade
- 12-inch thick clean soil/gravel (consider need for soil gas collection or vents)
- 40-mil FML liner, keyed in
- 1/4-inch thick geonet liner
- 24-inch thick topsoil
- revegetate
- downgradient wells, one upgradient minimum, for monitoring purposes

4) Post-Cleanup Sampling Requirements

Post-remediation sampling would be initiated in the FWA to evaluate the remedial action in both the residential and industrial FEUs. The sampling program would involve the following components:

a) Residential FEUs (FEUs 2 and 3):

- 10 samples across both FEUs are planned to be taken each year, at locations in the FWA to be determined each year at U.S. EPA's discretion
- analyze for total PCBs year 1 through 4
- analyze for nine chemicals of concern in year 5 (i.e., arsenic, benzo(a)pyrene, beryllium, hexachlorobenzene, hexachloro-butadiene, PCBs, 1,1,2,2,-tetrachloroethane,

tetrachloroethene, and trichloroethene)

- review results each year, evaluate data to assess the need for further sampling and potential changes in sampling locations, and evaluate the need for remedy repairs, in accordance with the Superfund Program's National Contingency Plan regulation (40 CFR Section 300)
- regarding duration of this sampling, post-remediation monitoring will extend at least for a period of 5 years; at the end of the 5 year period, a re-evaluation will be made as to the appropriateness of extending the monitoring time period (post-remediation monitoring will not necessarily terminate after 5 years)

b) Industrial FEUs (FEUs 4, 6, and 8):

- 15 samples across the three FEUs are planned to be taken each year, at locations in the FWA to be determined each year at U.S. EPA's discretion
- analyze for PCBs in year 1 through 4
- analyze for nine chemicals of concern in year 5 (i.e., arsenic, benzo(a)pyrene, beryllium, hexachlorobenzene, hexachloro-butadiene, PCBs, 1,1,2,2,-tetrachloroethane, tetrachloroethene, and trichloroethene)
- review results each year, evaluate data to assess the need for further sampling and potential changes in sampling locations, and evaluate the need for remedy repairs, in accordance with the Superfund Program's National Contingency Plan regulation
- regarding duration of this sampling, post-remediation monitoring will extend at least for a period of 5 years; at the end of the 5 year period, a re-evaluation will be made as to the appropriateness of extending the monitoring time period (post-remediation monitoring will not necessarily terminate after 5 years)

5) Remedial Activity Locations

Figures 3, 4, 5, 6, 7, and 8 indicate the FWA areas in the residential areas (FEU2 and FEU3) located between East 16th Street and Route 11, and in the industrial areas (FEU4, FEU6, and FEU8) located between Route 11 and about 2,000 feet east of State Road, where remedial activities would take place under Alternative 7.

To implement the remedy, additional delineation sampling will be conducted prior to the beginning of remedial construction activities to ensure that the response areas are properly defined. In each FWA exposure unit prior to the beginning of construction, one PCB sample will be taken and analyzed in every 2,500 square feet residential FWA area (i.e., one sample every fifty feet along all north-south and east-west directions), and in all but twelve 2,500 square feet industrial FWA areas, which are downgradient or downstream of the FEU8 CUG exceedence areas. The twelve industrial FWA areas which are not planned to be sampled in this delineation effort are located near or along the outer edge of industrial floodplain areas where CUG exceedences were not previously indicated. Eight of these locations are in FEU 6 along the southern edge of the FWA in fenced-in areas of the RMI-Extrusion property, and four of these locations are in FEU 8 on the northeast edge of the FWA. In addition, HCB delineation samples are required to be taken around proposed response areas in FEU's 4 and 8 which were developed due to elevated HCB sampling results. U.S. EPA finds it acceptable to not do further delineation sampling in existing areas already slated for response actions.

Excavation and cover of contaminated sediments and surface soils will occur in those FWA areas designated for excavation, and will be refined through the delineation sampling. It is anticipated that based on the data previously collected and to be collected as described above, the excavation limits can be defined without additional sampling to be conducted during construction.

6) Other Requirements

A temporary access road would be installed along most of the floodplain area. This temporary road would be made of crushed stone and would have periodic access points to existing roadways. It would be removed after construction and disposed of properly. The temporary access road would allow access to and along the floodplain areas from the roadways during construction, be made of crushed stone and 1/4-inch thick geonet liner, and will be removed after construction and disposed of either in the on-site landfill or if clean in other on-site or off-site areas.

The destruction, loss, degradation or disturbance of any FWA areas not slated for remedial response activity due to impacts from construction activities and the final remedy should be avoided or minimized to the extent practicable, because the ecological value of the FWA is generally high and destruction or disturbance of existing FWA habitats would have negative impacts.

Long term operation and maintenance and post closure care of the remedial action must be conducted to help ensure the remedy's effectiveness.

Institutional controls must be placed on deeds and title for properties where: contamination will remain in the FWA; the landfill will be constructed; or hazardous substances, pollutants or contaminants will remain above levels that allow for unlimited use and unrestricted exposure. For the landfill, the deed restrictions must prevent residential, industrial or other development on the landfill. For all other properties, the deed restrictions must provide notice to any subsequent purchaser or prospective developer of the presence of hazardous substances and of the requirement to conduct all development activities in such a manner as to not release contamination towards Fields Brook.

Reviews of the selected remedy must be conducted every five years after the remedial action is initiated to assure that human health and the environment are being protected by the remedial action. This is required because hazardous substances, pollutants or contaminants will remain in the FWA and in the landfill area above levels that allow for unlimited use and unrestricted exposure.

Access restrictions must be provided to help ensure that the public is protected from and adequately warned of potential exposure to the hazardous substances remaining at the site. These provisions shall minimally include enclosure of the entire landfill area with a fence with signs posted every 100 feet warning of the presence of hazardous substances.

B) ARARs to be Met:

Section 121(d) of CERCLA requires that Superfund remedial actions meet ARARs. In addition to ARARs, the ARARs analysis which was conducted considered guidelines, criteria, and standards useful in evaluating remedial alternatives. These guidelines, criteria, and standards are known as TBCs ("to be considered"). In contrast to ARARs, which are promulgated cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations, TBCs are guidelines and other criteria that have not been promulgated or are not directly applicable. The selected remedy will comply with the ARARs and the TBCs listed in Tables 4-1 and 4-2 which are attached to this ROD.

Location-specific ARARs establish restrictions on the management of waste or hazardous substances in specific protected locations, such as wetlands, floodplains, historic places, and sensitive habitats. Table 4-1 provides a listing of location-specific ARARs for the selected FWA remedy. Action-specific ARARs are technology-based or activity-based requirements or limitations on actions taken with respect to remediation. These requirements are triggered by particular remedial activities that are selected to accomplish the remedial objectives. The action-specific ARARs indicate the way in which the selected alternative must be implemented as well as specify levels for discharge. Table 4-2 provides a listing of the action-specific ARARs for the selected FWA remedy. The action-specific ARARs listed in Table 4-2 include the Ambient Water Quality Criteria and the Ohio Water Quality Standards, which contain specific standards that would be applicable if remediation water or treatment plant wastewater is discharged directly to Fields Brook or the Ashtabula River. Chemical specific ARARs are incorporated into Tables 4-1 and 4-2.

In addition to the water quality criteria, substantive requirements of National Pollutant Discharge Elimination System (NPDES), as implemented under Ohio regulations, would also be applicable to wastewaters planned to be discharged to Fields Brook which will require treatment. These wastewaters include liquids generated during construction activities such as dewatering liquids, excavation area liquids, and liquids generated during construction of the on-site consolidation area. Discharges to Publicly Owned Treatment Works (POTWs) may be pursued as an alternative discharge location. However, such discharges must also comply with limitations to ensure acceptable discharge from the POTW after treatment. The specific discharge levels will be determined during the design stage in coordination with OEPA.

It is expected that most of the soils and sediments to be excavated from the FWA for disposal into the on-site consolidation area landfill will contain PCBs exceeding 50 ppm. Excavation of these wastes and soils and consolidation on-site will be considered disposal of PCBs pursuant to 40 CFR 761.1(b). In this case, 40 CFR 761.60(a)(2) requires any non-liquid PCBs at concentrations of 50 ppm or greater in the form of contaminated soil, rags, or other debris to be disposed of in an incinerator which complies with 761.70 or in a chemical waste landfill which complies with 761.75.

The selected remedy provides for disposal of the PCBs in a landfill that does not meet the following requirements of Section 761.75(b): requirement for a fifty foot distance between bottom liner and historical high water table (761.75(b)(3). Pursuant to 761.75(c)(4), the Regional Administrator may determine that one or more of the requirements in 761.75(b) is not necessary to protect against unreasonable risk of injury to health or the environment from the PCBs, and may waive such requirements. The Regional Administrator has waived the requirements in 761.75(b)(3) for a fifty foot distance between bottom liner and historical high water table for the following reasons:

1. the landfill to be constructed which includes a low permeability site cover, double lined unit, leachate collection system, leachate detection system, a bottom clay liner which shall be at least 5 feet above the historical high ground water table, long term monitoring, access restrictions, and institutional controls will provide protection to human health and the environment against unreasonable risks of injury;

2. no significant reduction in the long term risks would be gained from the off-site disposal of the PCBs contained within the sediments and soils to be excavated;

3. the costs for off-site disposal of the PCBs is

potentially large; and

4. the consolidation unit to be built will provide for adequate protection of the underlying groundwater resource.

Since the remedy provides for containment of the PCB contamination above 50 ppm, no additional protection to the public health or the environment would be added by off-site transport and disposal of the soils in an off-site incinerator complying with 761.70 or in an off-site chemical waste landfill complying with 761.75(b), or by requiring the on-site landfill to comply with all of the requirements of Section 761.75(b). This finding and waiver is established by signature to this Record of Decision, as required in 761.75(c)(4).

The material excavated for permanent disposal into the on-site consolidation unit will be consolidated and temporarily staged and stored above the 100 year flood elevation on one of the industrial properties. The on-site landfill must meet State of Ohio requirements for construction of a solid waste management unit including setback requirements.

Regulations related to the dewatering of the soils and sediments prior to consolidation must be met, including 40 CFR 264.228(a)(2), which requires elimination of free liquids by removal or solidification. Thus, it is required that dewatering of the excavated soils and sediments to be landfilled will occur in part to ensure that no free liquids will remain in the soils and sediments prior to disposal into the landfill unit.

Treatment and air emission requirements relevant to hazardous waste in 40 CFR 260-268 are not anticipated to be ARARs since no listed hazardous wastes are known to have been disposed of in the FWA. Also, leachate samples collected from sediments within Fields Brook were found not to be hazardous waste by characteristic. Notwithstanding the above determination regarding placement or disposal, Tables 4-1 and 4-2 identifies the ARARs to be followed and met during implementation of the selected FWA remedy. While several of the regulations listed in Tables 4-1 and 4-2 may not be applicable due in part to the above placement and disposal determination, they are considered relevant and appropriate and thus must be met.

Actions must be taken to minimize the destruction, loss, or degradation of wetlands due to construction activities and the final remedy, including possible compensation for wetlands that will be adversely affected by the selected remedial action. A detailed wetland mitigation plan is required prior to construction of the remedy. An evaluation of the effects of the excavation on the wetland hydrology will have to be conducted.

This evaluation will be prepared based in part on input from the U.S. Army Corps of Engineers and OEPA, and actions must be implemented to provide for compliance with the floodplain/floodway regulations. Various ARARs apply to this issue, including Clean Water Act Section 404 and 401; Executive Order 119990; 40 CFR 6, Appendix A; and 40 CFR 6.302(g). Actions must be conducted as necessary to comply with the Clean Water Act's Section 401 and 404 regulations, potentially including investigations; modeling; alternative evaluation; creation of compensatory storage for lost flood plain storage; use of artificial channels combined with detention facilities or other technologies to maintain stream capacity without increasing the average velocity through the Site; excavation of soils and sediments from the FWA and consolidation on-site; actions to prevent or minimize negative impacts on the wetlands due to construction activities and the final remedy; actions to minimize the destruction, loss, or degradation of wetlands, including compensation for wetlands that will be lost or adversely affected by the selected remedial action; and other actions determined necessary.

XI. EXPLANATION OF SIGNIFICANT CHANGES

There are no significant changes from the recommended alternative described in the proposed plan.

XII. STATUTORY DETERMINATIONS

U.S. EPA's selected alternative provides the best balance of trade-offs among alternatives with respect to the criteria used to evaluate remedies. Based on the information available at this time, therefore, U.S. EPA believes the selected alternative will protect human health and the environment, will comply with ARARs, would be cost-effective, and will utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The selected alternative will not satisfy the preference for treatment as a principal element.

ATTACHMENT 1 TO THE RECORD OF DECISION SUMMARY

RESPONSIVENESS SUMMARY
FLOODPLAINS/WETLANDS AREA
RECORD OF DECISION
FIELDS BROOK SITE, ASHTABULA OHIO

PURPOSE

This responsiveness summary has been prepared to meet the requirements of Sections 113(k)(2)(B)(iv) and 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1986 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires the United States Environmental Protection Agency (U.S. EPA) to respond to the comments submitted, either written or oral presentations, on the proposed plan for remedial action. All comments received by U.S. EPA during the public comment period were considered in the selection of the final remedial alternative for the FWA.

This document summarizes written and oral comments received during the public comment period of November 17, 1996 to January 17, 1997. The comments have been paraphrased to efficiently summarize them in this document. The public meeting was held at 7:00 p.m. on November 21, 1996 in the Auditorium of the Ashtabula Campus of Kent State University in Ashtabula Ohio. A full transcript of the public meeting, as well as all written comments received during the public comment period and all site related documents, are available for review at the Information Repositories, at the following locations: 1) Ashtabula County District Library, 335 West 44th Street, Ashtabula, OH; and 2) U.S. Environmental Protection Agency, Waste Management Division, Records Center, 7th Floor, 77 West Jackson Blvd., Chicago, IL.

I. Comments to 11/96 FWA Proposed Plan:

A) Written Comments

Comment: Implementation of the preferred alternative (Alternative 7), nor any of the other alternatives presented in the Proposed Plan, does not provide adequate long term protection for the environment, including federal and State trust natural resources. All of the alternatives leave significant residual Site contamination in the floodplain and wetlands which will continue to pose an unacceptable hazard and threat of injury to trust natural resources therein, as well as to the natural resources of Fields Brook and its receiving waters. The trustees believe that the ecological risks identified in the Site ecological risk assessments can and should be further reduced by making significant improvements to the alternative remedial actions. These improvements include, but are not limited to, environmentally sensitive adjustments of the proposed cleanup goals, depth and area of excavation, habitat replacement and monitoring.

Response: U.S. EPA believes that the response actions to be conducted as proposed through Alternative 7 in the FWA soils would protect the various populations of plants and animals which exist or may exist along the floodplain area for this site, in part by significantly reducing the short- and long-term risks to ecological populations and reducing these population's potential uptake of contamination via soil and food to acceptable levels of exposure. Post-remediation hazard quotients (HQ's) for most receptors of concern are below 1 for each contaminant regarding exposure within the FWA, as indicated in the 10/96 FWA Feasibility Study, Attachment 1. For all receptors of concern at this site, the highest post-remediation HQ's calculated was below 5, which is within an acceptable range and within an order of magnitude of the acceptable post-remediation objectives U.S. EPA strives to achieve for all ecological cleanups. Further, the planned monitoring is sufficient to determine both the effectiveness of the selected remedy and the need for any further action.

Also, Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands) requires federal agencies to take actions which minimize the potential harms to floodplains and wetlands if the only practicable alternative requires construction in these areas. Within the FWA FS, comparative trade-offs between the destruction of habitat in place and the reduction in residual chemical concentrations which would result if additional excavations occurred in the FWA were considered. Alternative 7 offers the best balance between protectiveness, cost effectiveness and minimization of harm to the environment of all alternatives, including the variation of Alternative 5 described above, and would be protective of both human health and the environment.

Comment: We disagree with the statement on page 3 that potential risks to the environment would be addressed if risks to people from ingestion of soil are addressed. The proposed cleanup goals on page 4 for PCBs (6 ppm residential and 50 ppm industrial) and HCBs (80 ppm residential and 200 ppm industrial) far exceed the ecological cleanup goals (0.37 ppm PCB and 0.59 HCB) calculated by U.S. EPA-Edison in Table 1 (column 3, page 4) of the October 1996 Baseline Ecological Risk Assessment Report (BERAR). In addition, the Proposed Plan does not stipulate cleanup goals for nine other Site contaminants, including mercury, lead, copper and cadmium, all of which have ecological cleanup goals specified (column 3, page 4) in the BERAR. Considering the great disparity in cleanup goals presented in the BERAR and Proposed Plan, we can not discern how U.S. EPA used the BERAR to help "form the basis for this proposed remediation plan" (bottom of column 2, page 2). Until the Proposed Plan cleanup goals are shown to have a firm scientific link to the BERAR, we cannot agree with or support them as being protective of the environment, including our trust resources.

Response: U.S. EPA's 1994 "Ecological Risk Assessment Guidance for Superfund" specifies that risk management decisions should be conducted by considering a range of risk estimates. This guidance characterizes this range, with one boundary to be set based on conservative assumptions and one to be set based on less conservative, measured site-specific values. Exposure factors are incorporated in the risk range development. The FWA remedy is based on a range of cleanup goals as recommended in the guidance. The Baseline Ecological Risk Assessment Report (BERAR) identifies a range of values, appropriate as potential remediation goals, for ecological receptors at the site. These values differ primarily on the level of assumptions used to calculate parameters such as bioavailability, home range size, etc. Values developed by U.S. EPA Edison are acknowledged to be very conservative and in some cases are below known background concentrations. The values identified in the BERAR were used in conjunction with other information to develop clean-up goals considered appropriate for the site for protection of human health and the environment.

Specific clean-up goals for other contaminants such as lead, copper and cadmium, were not specifically identified in the Proposed Plan. Previous data analysis conducted as part of the human health assessment, as well as an evaluation of residual ecological risk values (HQ's), indicated that other contaminant concentrations would be proportionally reduced as concentrations of PCBs and HCBs are reduced through adoption of the proposed remedial action plan.

Comment: U.S. EPA (top of column 1, page 4) states that PCBs and HCBs were the two compounds causing the majority of the human health risk, and that if the cleanup activities removed the elevated areas of PCB and HCB soil contamination, then the cleanup would also remove other COCs because these exist where elevated levels of PCBs and HCBs exist. Although this finding is made in the context of human health, the U.S. EPA later states (middle of column 2, page 4) that the cleanup actions will also protect the environment. Review of the FWA data indicates arsenic concentrations at sample points outside the proposed cleanup areas which exceed the PRPs ecological cleanup goals 38 times. Clearly, this Site contaminant, and possibly others will not be affected by implementing the preferred remedy or any of the alternatives, and will continue to pose ecological risk. Therefore, the proposed remediation of PCBs and HCBs will not simultaneously remove or contain elevated concentrations of all of the other COCs.

Response: In evaluating remedial alternatives, U.S. EPA considered residual risks associated with all chemicals of potential concern, including arsenic. Arsenic is one contaminant which has cleanup goals in the BERAR below background levels at the site. Arsenic is present in the watershed as a natural constituent of the local geology at levels at which exposure risks approximate those found in background areas. Since U.S. EPA generally does not require cleanup of contaminants below background levels at sites, the arsenic cleanup goal for the FWA is set at the background level for the FWA, which is 27 ppm. Residual risk numbers were generated assuming area use factors of 1 (100% of exposure being on-site) for a number of receptors, including the shrew, which had the highest residual arsenic exposure risks (BERAR, page 34). However, as indicated in the comment response above, the highest post-remediation HQ's calculated for all COCs for all receptors of concern at this site was below 5, which is within an acceptable range and within an order of magnitude of the acceptable post-remediation objectives U.S. EPA strives to achieve for all ecological cleanups.

Also, it is clear that the dominant risk in the FWA to both human and ecological receptors is from PCB and HCB, and that the significant levels of all other COCs exist where elevated levels of PCBs and HCB exist, as indicated in part by the 12/11/96 "FWA Delineation Sampling Maps" deliverable from Woodward Clyde which has been included in the Administrative Record. Based on a review of the data, U.S. EPA has found that if a remedial cleanup to the HCB and PCB FWA CUGs on average throughout each exposure unit occurs, the low levels of all other contamination and other COCs remaining in the FWA after cleanup is completed would be protective of both human health and the environment for each exposure unit.

Comment: Page 5, Summary of Alternatives - bottom of 2nd paragraph and Page 8, item D) Remedial Activity Locations - middle of second paragraph: The PRPs are not in agreement with the FWA delineation sampling program as described in the Proposed Plan. The PRPs described a delineation program to U.S. EPA that involved further delineating existing response areas developed in the FS. The PRPs did not propose to collect additional samples at fifty-foot intervals in the entire FWA.

The text indicates that soil sampling data will be collected at fifty-foot intervals in the floodplain during delineation sampling programs. This could be interpreted to mean across the entire Floodplain/Wetland Area. The PRPs have concerns that U.S. EPA has misinterpreted the intent of the delineation sampling program discussed during the September 26, 1996 meeting and as described in Section 4.5 of the FWA FS provided to U.S. EPA in October 1996. As a general comment, the PRPs do not intend to collect soil samples in the entire FWA at fifty-foot intervals across the entire FWA, for the following reasons:

During earlier phases of the investigation more than 250 floodplain samples have been collected in the five FEUs. These sampling programs were approved by U.S. EPA; in order to characterize the FWA, develop remedial alternatives and satisfy Remedial Investigation (RI) objectives regarding the nature and extent of the 11 COCs. The previous sampling programs were based on systematic sampling along transects and spatially distributed so as to satisfy U.S. EPA concerns regarding definition of locations of COC concentrations on both sides of Fields Brook. Grid sampling across the entire FWA is not necessary. It is a waste of financial resources.

If grid sampling were to be considered, it should have occurred in 1993-1994 when the RI activities were in progress and not at the design phase of the project and would have replaced the systematic sampling program (which was approved by U.S. EPA and implemented by the PRPs).

Since the FS has been completed based on the approved systematic sampling program, and response areas identified, it is appropriate at this time to conduct a delineation sampling program to support the final FWA design. The purpose of the delineation sampling program is to properly define the response areas that have been developed in the FWA FS for cover and excavation and substantially reduce the uncertainty that any significant contaminated areas have been missed. The FWA FS described that the delineation sampling program was intended to further delineate current response area boundaries and sample in areas where data points are widely spread. The delineation sampling program intended to be conducted by the PRPs consisted of approximately 200 samples located within the FWA. A fifty-foot grid would be used to identify possible sampling locations, in order to better define response boundaries, fill in data gaps, and to develop cutlines for use in preparing design drawings. U.S. EPA requested that sampling maps be submitted prior to field work in order to review proposed sampling locations. The delineation program and O&M sampling proposed by the PRPs would supplement existing data and would be sufficient and protective for the proposed alternative.

<u>Response:</u> U.S. EPA has thoroughly considered this issue, and finds that to provide better confidence in understanding the extent of contamination throughout the FWA, and to provide assurance that the response areas are properly and completely defined, To implement the remedy, additional delineation sampling will be conducted prior to the beginning of remedial construction activities to ensure that the response areas are properly

defined. In each FWA exposure unit prior to the beginning of construction, one PCB sample must be taken and analyzed in every 2,500 square feet residential FWA area (i.e., one sample every fifty feet along all north-south and east-west directions), and in all but twelve 2,500 square feet industrial FWA areas, which are downgradient or downstream of the FEU8 CUG exceedence areas. The twelve industrial FWA areas which are not planned to be sampled in this delineation effort are located near or along the outer edge of industrial floodplain areas where CUG exceedences were not previously indicated. Eight of these locations are in FEU 6 along the southern edge of the FWA in fenced-in areas of the RMI-Extrusion property, and four of these locations are in FEU 8 on the northeast edge of the FWA. In addition, HCB delineation samples are required to be taken around proposed response areas in FEU's 4 and 8 which were developed due to elevated HCB sampling results. U.S. EPA finds it acceptable to not do further delineation sampling in existing areas already slated for response actions.

This degree of delineation is needed in part because contamination distribution is not even and consistent throughout the FWA. Review of the existing FWA data distribution along various FWA outer edge areas, particularly in FEU4, has discovered incidences of contamination at the 100 year floodplain line above the cleanup goals. In rare cases, the data along the outer edge of the FWA is higher in concentration than in FWA areas between the outer edge and the brook.

U.S. EPA is concerned that by not doing the 50' grid spacings in various large industrial areas not currently slated for response, the results will be unacceptably biased towards a lessening of the response areas. Further, such sampling permits a lessening of the degree of future O&M chemical monitoring to be conducted in part due to the expectation that the extent of contamination would be determined through 50' grid sampling in all FWA areas.

<u>Comment:</u> Page 7, item B), Landfill Requirements: The description of the on-site landfill should be referred to as the on-site consolidation area, to be consistent with the FS text and language used to describe this area by the PRPs.

<u>Response:</u> The on-site landfill may be described either as a landfill or a consolidation area, and inconsistencies regarding the reference to this unit would not change the components or requirements for the installation or operation and maintenance of this unit. Thus, either of the two terms may be acceptably used interchangeably, and no text change is required.

<u>Comment:</u> Page 7, item B), Landfill Requirements: During the September 26, 1996 meeting with the PRPs and U.S. EPA, the on-

site consolidation area was described as a storage area that would contain materials from the following areas of the Fields Brook site: a) Soil excavated from FWA response areas; b) Sediment excavated from Fields Brook as part of Sediment Operable Unit (SOU) remediation; and c) Excavated haul road material from construction of FWA and SOU remedial areas.

<u>Response:</u> U.S. EPA would find it acceptable to place excavated sediment from Fields Brook as part of Sediment Operable Unit (SOU) remediation and excavated haul road material from construction of FWA and SOU remedial areas into the on-site landfill to be constructed for the disposal of FWA soils. However, these excavated materials to be placed into the landfill must be shown not to be a "hazardous waste" as defined by U.S. EPA's RCRA program (i.e., the source area soils must not fail RCRA's 'Toxic Characteristic Leaching Procedure' testing).

<u>Comment:</u> U.S. EPA should consider the following variation to Alternative 5 (top of column 3, page 5): Excavation, Backfill, and On-Site Disposal. If disposal occurs in the "On-site consolidation area" (bottom of column 1, page 6), costs would be reduced from the $19.0 million cost of Alternative 5 by perhaps as much as $7.0 million. If this cost reduction is correct, the cost of this variation to Alternative 5 would be approximately $12.0 million. This figure is far more cost-effective than Alternative 5 and much closer to the $6.9 million cost for Alternative 7. The main advantage to this variation to Alternative 5 is better protection for the environment through increased removal of contaminated soil (13,200 additional cubic yards would be excavated over Alternative 7, in accordance with the proposed cleanup criteria and excavation depth) from the FWA.

<u>Response:</u> U.S. EPA agrees that on-site disposal is generally more cost effective than off-site disposal, and agree in principle that the cost savings to Alternative 5 as noted above may be likely. However, the relatively low level of potential increased protectiveness provided by the increased FWA soil excavation provided by this variation of Alternative 5 does not offset the increased costs required to implement this alternative over the cost of Alternative 7 (i.e., at least $5.1 million increased costs). Because the highest post-remediation HQ's calculated were below 5 if Alternative 7 is implemented, and because the cleanup goals and remedial action objectives would be met or exceeded for human health, Alternative 7 offers the best balance between protectiveness and cost effectiveness of all alternatives, including the variation of Alternative 5 described above. Also, the additional damage to the wetlands that would occur under the variation to Alternative 5 described above also weighs against this alternative.

Comment: We believe it is misleading to characterize (bottom of column 2, page 4) post-remediation residual PCB contamination as an average (1 ppm for the residential exposure units and 6 to 8 ppm for the industrial exposure units). The residual PCB contamination should be characterized as a range of the lowest existing concentration up to 6 ppm for residential and 50 ppm for industrial. Since the post-remedial PCB concentrations would greatly exceed U.S. EPA-Edison's BERAR ecological cleanup goal of 0.37 ppm, we can not agree with U.S. EPA (middle of column 3, page 4) that the Proposed Plan cleanup goals represent acceptable levels of exposure or will provide for the future health and viability of ecological populations.

Response: It was considered appropriate to characterize post-remediation residual concentrations as averages based on an understanding of most post-remediation exposure scenarios. In many cases, including both human and ecological receptors, post-remediation exposure is likely to occur over a certain unit area over the site. The typical home range of many organisms is such that they are likely to be exposed to a range of concentrations which may be higher in some locations and lower in others. As a result, exposure is expected to be represented by an average concentration within the exposure unit. For some species such as field mice, however, exposure levels may represent more site-specific concentrations. For these species, however, exposure to higher concentrations would occur to only a fraction of the total population of the species inhabiting the Fields Brook site.

Comment: We disagree with U.S. EPA's conclusion (page 4, column 2, paragraph 3, and column 3, paragraph 3) that the residual contaminant concentrations following remediation would necessarily pose acceptable levels of exposure to ecological receptors and thereby protect the environment. Much of the floodplain lies within the riparian zone of Fields Brook and is closely associated with the aquatic environment. Yet the ecological risk assessments completed for the Site did not include a full assessment of the aquatic environment. Biotic sampling, such as fish tissue analysis for COCs, was not conducted to properly evaluate the risk to aquatic organisms and the risk to terrestrial receptors such as the highly piscivorous mink and great blue heron. It is, therefore, imperative that U.S. EPA require post-remedial biological monitoring of the aquatic and terrestrial environments in order to provide a scientific basis for verifying the presumed effectiveness of the proposed remedy. Until actual measurements of biotic systems are conducted, the trustees do not believe that U.S. EPA will be able to adequately demonstrate whether the proposed remedy is effective in protecting the environment.

The proposed post-remediation sampling (middle of column 3, page 7) is currently limited to chemical sampling and analysis for a period of 5 years. Considering that the proposed cleanup goals for PCBs (6 ppm residential and 50 ppm industrial) greatly exceed the ecological cleanup goals recommended in the BERAR (U.S. EPA-Edison 0.37 ppm and the PRPs Aroclor 1260 0.35 ppm), and that several of the COCs bioconcentrate and/or biomagnify in ecological food chains (e.g., PCB, HCB, cadmium, copper, mercury), we recommend that U.S. EPA require sampling and analysis of COCs in floodplain flora and fauna as part of the post-sampling requirements. We also strongly recommend that U.S. EPA extend the monitoring period at least 20 years in order to verify the long term environmental protectiveness of the remedy. This length of time is reasonable, considering that PCBs may persist for 75 years or longer.

Table 1 of the BERAR (columns 2 and 3, page 4) lists ecological clean-up goals for the following Site contaminants that are not included in post-remediation sampling (middle of column 3, page 7): fluoranthene, napthalene, phenanthrene, hexachlorethane, cadmium, copper, lead, mercury and zinc. Please explain why these contaminants are not included in post-remediation sampling. In addition, HCB should also be sampled along with PCBs in years 1 through 4 because the cleanup and protectiveness of the preferred remedy is based on the assumption (page 4) that if the cleanup activities removed the elevated areas of PCB and HCB soil contamination, then the cleanup would also remove other COCs in the floodplain area because this is where the other COCs exist.

Response: It is acknowledged that a full assessment of the aquatic environment of Fields Brook, which has only developed since the brook became a continuous stream due to industrial discharges, was not completed. To help ensure protectiveness of the aquatic environment, a separate focused ecological risk assessment of the brook sediment was recently prepared by U.S. EPA; this assessment estimates post-remediation risk levels to ecological receptors such as mink who are or may be exposed to the brook. This focused assessment does recognize that the post-remediation average concentration chronic hazard quotient (HQ) calculations using the above noted cleanup goals indicate that there may be several species with HQ exceedences of 1, and thus the potential still exists that there is a potential ecological residual risk using the calculated cleanup goals.

However, U.S. EPA believes that the response actions to be conducted based on cleanup of both the FWA soils and brook sediments based on the cleanup goals set for the brook sediment and for the FWA soils would protect the various populations of plants and animals which exist or may exist within the brook and along the floodplain area for this site. The response actions would reduce the short- and long-term risks to ecological populations and reduce these population's potential uptake of contamination via soil and food to acceptable levels of exposure.

Regarding the brook cleanup, EPA's focused ecological risk assessment of the brook sediment indicated that post-remediation HQ's for most receptors of concern (ROC) are below 1 for each contaminant regarding exposure within the FWA. There were two contaminants which had post-remediation HQ exceedences of 1 for brook sediment for mink; for PCBs in FEU6, the HQ is approximately 13, and for HCB, the HQ is approximately 6. U.S. EPA believes that the response actions to be conducted in FWA soils and brook sediments would protect mink, in part because the typical home range of mink is such that they would be exposed to an area encompassing several exposure units, and would also feed from areas within both the brook and FWA, as well as outside of this area. As a result, exposure to higher concentrations would occur in only a fraction of the total food intake for mink, and the population of the species inhabiting the Fields Brook site would be protected.

Also, the surface sediments of the brook will be diluted with cleaner bedload stream sediments over time after the source area, brook and FWA remediations occur, and this will significantly reduce the average residual sediment surface concentrations, for several reasons. The net average suspended sediment concentrations coming from source properties during storm events after source remediation occurs will be well below CUGs, and since the industrial properties comprise only approximately ten percent of the entire brook watershed, the net suspended sediment concentrations from the brook watershed will likely be at or near non-detect levels for all contaminants of concern. Further, the upstream half of Fields Brook was never contaminated with significant levels of COCs, and future storms will move clean, non-contaminated sediments down from these upstream areas and cover up any residual low level contamination left in brook sediments after remediation. Thus, after brook remediation, the net average residual concentrations in brook sediments which could be released during future storms are expected to be well below the CUGs.

Also, as discussed in earlier comment responses, U.S. EPA believes that the FWA remedial response actions to be conducted would protect the various populations of plants and animals which exist or may exist along the FWA, in part because the FWA's post-remediation HQ's for mink are below 1 for each COC, below 5 for all other ROCs, which is within an acceptable range and within an order of magnitude of the acceptable post-remediation objectives U.S. EPA strives to achieve for all ecological cleanups. Thus, U.S. EPA feels that sediments will be remediated to levels protective of aquatic receptors and wetland and terrestrial receptors which might utilize the aquatic ecosystem.

Current post-remediation monitoring plans are to include sampling of soil and sediment within the Floodplain/Wetland Area. This level of monitoring is appropriate to evaluate site conditions following clean-up. As with many baseline risk assessments, results of chemical analysis can be used in conjunction with acceptable exposure models to estimate potential risk levels to ecological receptors at the site.

The range of post-remediation chemicals to be monitored do not need to be increased at this time, because previous data analysis conducted as part of the human health assessment, as well as an evaluation of residual ecological risk values (HQ's), indicated that other contaminant concentrations would be proportionally reduced as concentrations of PCBs and HCBs are reduced through adoption of the proposed remedial action plan. The eleven key chemicals of concern, and primarily PCBs and HCB, will be analyzed yearly for five years after cleanup, and these contaminants are the key indicators regarding whether the FWA remedy remains protective and whether chemical concentrations are increasing or not in the FWA after cleanup.

Regarding duration of sampling, U.S. EPA's current recommendation is for post-remediation monitoring to extend for a period of 5 years. At the end of the 5 year period, a re-evaluation will be made as to the appropriateness of extending the monitoring time period. Post-remediation monitoring will not necessarily terminate after 5 years.

Comment: The post-remediation sampling does not provide action levels that will trigger additional remediation. U.S. EPA should establish such action levels for both chemical and biological sampling in concert with the trustees.

Response: Action-levels which may trigger additional remediation have not been identified at this time. Appropriate action levels will be determined in the future as monitoring is conducted. In this way, action levels can be developed which incorporate the most recent toxicity information available for the contaminant and/or ecological receptor of concern. New data on contaminant affects is continuously being developed, which can be applied in establishing appropriate action levels. Establishment of action levels now, without the proper information, would be meaningless and may limit application of information that may become available in the future.

Comment: The soil cover process option component of Alternative 7, as well as alternatives 2 through 6, is referred to in the Proposed Plan and Section 6.0 of the October 1996 Final Feasibility Study as providing a "permanent remedy." However, this option would leave significant concentrations of contaminants in-place which could potentially become exposed to terrestrial receptors as well as recontaminate the stream channel. In Alternative 7, only six inches of cover will be placed over PCB-contaminated soils ranging from 6 to 30 ppm. According to Table 5-1 of the Feasibility Study, the Alternative 7 cover areas comprise 160,000 square feet or approximately 3.7 acres. Since beaver dam induced stream re-routing has been documented in several exposure units at the Fields Brook Site, there is a very real potential for either beaver dam induced stream re-routing or future meanders to cut through areas of the floodplain containing soil that is contaminated above levels that are considered protective of the aquatic environment. In addition, the COCs may be brought to the surface by fallen trees, wet periods, storm events and burrowing animals. Also, adding a six-inch soil cover may inhibit the growth of wetland vegetation.

Considering that the zone of biological activity is generally agreed to be 12 inches, and that the Alternative 7 cover areas would be contained in a dynamic environment subject to physical and biological perturbations, we do not see how the U.S. EPA could determine with confidence that the 6-inch cover meets the criterion for long term effectiveness and permanence. The trustees are doubtful that Alternative 7 fully meets the evaluation criterion for long-term effectiveness and permanence due to the dynamic factors affecting the Site location and stability.

Response: A soil cover option for portions of the Fields Brook Floodplain Area is proposed as part of the plan for the site, and would occur only in portions of the downstream half of the FWA remediation area. This option will be employed to areas with PCB concentrations ranging from 6 to 30 ppm. Concentrations of contaminants which may exist under the clean cover layer might eventually reach the surface, but the residual surface levels would likely be lower than the concentrations of the soil under the soil cover due to soil mixing which may be expected to occur due to freeze/thaw, earthworm turnover and other phenomenon. As a result overall soil concentrations at the surface are expected to be lower than existing levels in the cover areas. Also, as discussed in the FWA FS report, there is no "general agreement" in the technical literature on a depth of a biologically active zone in environments such as the FWA.

Operation and maintenance (O&M) requirements for the site are proposed to control activities or actions which may alter stream flow routes. This is to include the riprap of stream banks to stabilize banks and reduce erosion potential. If beaver activities threaten to alter the stream route, action will be taken as part of O&M to control such events. Possible stream meandering will be largely controlled by bank engineering in the post-remedy environment.

Previous reviewers have identified the potential impact of soil cover placement on wetland hydrology within the floodplain areas. Section 404/401 of the Clean Water Act is an identified ARAR for the site. Issues relevant to wetland impacts are to be addressed in the Section 404/401 submittal that is a component of the 90% Design Phase. The potential for cover areas to reduce the wetland character of the floodplain vegetation has been accounted for in the overall remedy. Wetland character will be retained to the extent possible.

Comment: The description for Alternative 7, as well as Alternatives 2 through 6, state that wetlands mitigation will be considered. We request that the U.S. EPA establish wetlands mitigation as a requirement based on ARAR compliance under the Clean Water Act. There is no doubt that the activities being discussed, i.e., vegetative clearing, excavation, filling, road building, use of heavy equipment, will harm wetlands. Consequently, we believe U.S. EPA should determine the amount, type, and location of replacement wetlands.

Table 5-1 of the October 17, 1996 Feasibility Study indicates that Alternative 7 affects 572,000 square feet of response area (excavation and cover area). We believe that most, if not all of this acreage (13.13 acres) is wetlands. However, U.S. EPA should confirm the amount of wetlands being impacted by excavation and cover, and provide a breakdown of acreage by wetland types. The amount and types of wetlands affected by the proposed access road should similarly be determined. We recommend that the U.S. EPA require a minimum of 1.5 to 2.0 acre replacement for each acre of affected wetland. The exact amount of replacement within this range should be determined by the trustees and U.S. EPA based on our consideration of wetland value, scarcity and time needed to restore wetland functions. The replacement wetlands should be located within the Fields Brook, or a nearby, watershed, and preferably in one location.

We are concerned about the design and longevity of the proposed temporary access road. This structure could interfere with floodplain and wetland hydrology, become a source or cause of erosion and contamination, disrupt or interfere with wildlife movements, and degrade or destroy adjacent wetlands. We recommend that U.S. EPA coordinate the remedial design of this road with the trustees.

Response: Section 404/401 of the Clean Water Act is an identified ARAR for the site. Issues relevant to wetland impacts including mitigation needs and roadway impacts will be addressed in the Section 404/401 submittal that is a component of the 90% Design Phase. The State of Ohio will be involved in this review, in part because it currently has the lead role in managing the 401 program, and the State can coordinate reviews directly with the other trustees when the 404/401 review occurs.

Also, this comment appears to assume that the remedy will eliminate wetlands in place. This is not true. Wetland character will be present in the post-remedy environment of the FWA, and will be encouraged by (as documented in the FS report) the use of hydric compatible soils for backfill and in the replanting program.

Comment: Part of the plan for remediation of the FWA is to leave trees greater than twelve inches diameter at basal height and backfilling around them with six inches deep clean soil. My experience is that four inches of backfill over root zones is sufficient to cause tree decline, although not necessarily immediately. It is my experience that whenever filling is planned around existing trees, it is more economical to remove all existing trees prior to placing the backfill. This would be less costly to do now vs. five years from now, when installation and replacement costs are taken into account, and in addition the replacement tree will not have been retarded for five years.

Response: Although it is recognized that the potential for some tree death exists for the areas to receive soil cover, there appears to be conflicting data on the level of potential risk to trees. For example, one reference (Harris, R. W., 1992, Arboriculture: Integrated Management of Landscape Trees, Shrubs and Vines, Prentice Hall) states that many species of trees are capable of surviving burial of up to several feet of material. Eventually the root system grows up into the fill material or, depending upon the species, new roots may grow from the original root collar at the base of the tree or from the trunk itself. The concern is that the roots must receive adequate oxygen and not be subjected to buildup of carbon dioxide. This reference also recommends that compaction of the fill around the trees should be avoided, and suggests using equipment with a retractable boom so that the equipment stays outside the dripline of the trees if feasible. This recommendation will be incorporated into the ROD for the placement of six inches of clean soil cover in areas around all trees to be left standing in areas to be covered.

Also, potential tree deaths resulting from the cover option are to be addressed in the planned operation and maintenance (O&M) procedures for the site. The health of the large trees left in the FWA in cover areas will be monitored on a regular basis after the cleanup occurs in part to determine if the trees are stressed. If stress is indicated, steps may be taken during O&M to modify the soil cover to protect the tree. If the trees cannot be saved, the trees will be removed. Trees which die following remediation are to be replaced, albeit with trees from nurseries which have not yet reached maturity. Natural recruitment of trees in cover areas, as well as the planting of trees and shrubs, will also occur following placement of the cover.

Comment: U.S. EPA should emphasize function vs. character when conducting replacement vegetation. Herbaceous reed, rush, sedge and grass species thrive in hydric soils, control erosion, and enhance water infiltration, and can be first grown on 100% cocofibre mats which can then be placed down into the FWA as sod thereby providing almost instantaneous erosion control which would extend the planting window. If aesthetic concerns demand tree character, woody shrubs such as cornus stolonifra, trees such as acer rubrum and/or fraxinus pennsylvanica lanceolata are riparian species that also have an attractive appearance. These tree species can be successfully grown in the bank zone, but should be avoided in the splash zone.

Response: Future revegetation of areas disturbed during remedial activities will include use of erosion mats and regrowth of native vegetation. Additional information on revegetation of the Floodplain/Wetland Area, including which species will be replanted to achieve the goal of revegetation of native species in disturbed areas, will be addressed in a separate submittal during design of the FWA remedy.

Comment: Alternatives 5 and 6 (all excavation to 12-inch depth) seem to offer greater long term effectiveness and permanence than Alternative 7, but even these alternatives would not provide full long term protection. U.S. EPA confirms (Questions and Answers No. 20, Fields Brook Superfund Site Information Availability Session and Public Meeting, September 26, 1996) the contaminated soils below the 12-inch depth could be exposed by erosion during flooding events. Further modifications of Alternatives 5 through 7 would be needed to achieve a greater degree of long term effectiveness. These changes include cleanup goals that provide a greater reduction in environmental risk and excavation to depth of contamination. The extent of excavation should be driven by compliance to the cleanup level established for the Site and should not be limited by an arbitrary depth. By failing to excavate the full extent of contamination exceeding cleanup levels, the preferred and alternative remedies do not provide a reasonable assurance of protectiveness. Current data gaps, with respect to depth of contamination, should be addressed during the proposed design delineation sampling.

Response: Of the 23 deep soil samples taken between one-to-two feet from the surface in the FWA, only two samples indicated levels of any contamination above the acceptable Cleanup Goal levels. These two locations are in the FWA soils between Columbus Avenue and East 16th Street. The levels of contamination at these locations are only slightly above the cleanup goal levels and in these two locations the surface soils will be covered with six inches of clean soil. Since the FWA is primarily a depositional area, contamination has been left in almost all areas within the top one foot of surface soils. Thus, excavations below one foot are not required to achieve a protective remedy. Further, O&M for the remedy and the planned monitoring is sufficient to address these concerns and prevent or repair the effects of significant erosion. Also, any buried contamination that would become exposed at the surface would not be at its sub-surface concentration but at a lower level due to dilution with clean soil.

Comment: Confining pollutants does not get rid of them. Shallow wells in our area have nitrate contents of up to 60 ppm which we attribute to the fertilizers used by the numerous nurseries in the area. I favor Alternative #6 (incineration of wastes).

Response: Incineration of the lower-level contaminated soils would be very expensive and would not be cost effective. U.S. EPA has considered the likelihood of direct exposure by people to contaminated soils below the 6 inches of clean soil, and believes that the cover activities in the residential area of the FWA combined with the excavation activities will provide a protective remedy. The primary route of exposure to soils in the FWA is direct ingestion of soils, and a soil cover will effectively contain the low-level contaminated soils in place and prevent surfacing of the contamination. The City of Ashtabula provides drinking water to all residents in Ashtabula with water taken directly from Lake Erie, and this water is tested regularly and has not shown any exceedences of drinking water standards. In addition, nitrate is not one of the chemicals of concern within the FWA soils and incineration of nitrate contamination is not necessary to provide for protection to human health and the environment.

Comment: U.S. EPA's proposed FWA remedial action involves construction of an on-site landfill to be located on one of the properties within the Fields Brook watershed. In addition to placement of certain FWA soils into this landfill, it is requested that U.S. EPA also allow placement of certain excavated soils from Source Control areas of the Fields Brook site into the on-site landfill (e.g., soils/sediment containing PCB concentrations greater than 50 ppm originating from the ACME property). The placement of this material into the on-site landfill would be an alternative to transporting the material to an off-site facility.

Response: U.S. EPA would find it acceptable to place certain excavated soils from Source Control areas of the Fields Brook site into the on-site landfill to be constructed for the disposal of FWA soils. However, the source control soils to be placed into the landfill must be shown not to be a "hazardous waste" as defined by U.S. EPA's RCRA program (i.e., the source area soils must not fail RCRA's 'Toxic Characteristic Leaching Procedure' testing). Also, the parties who will be constructing the FWA landfill must agree to accept these soils.

B) Verbal Comments to the Proposed Plan From 11/21/96 Public Meeting

Comment: Why are we going to clean up Fields Brook and not clean up the Ashtabula River? Fields Brook flows into the Ashtabula River, and the River flows into the Lake, where the Ohio Water Works pulls water from an outlet. Because the chemical contamination has been in both the brook sediments and FWA soils for approximately fifty years since the second world war, the majority of the contamination has already leached out of the soils and sediments. However, when someone starts to move and churn up the sediments and soils, there will be significant releases of contamination, particularly during rainfall events. These releases would be unacceptable.

Also, Separate Written Comment: During times of northeasterly winds, there is a significant increase in raw water turbidity, total coliform bacteria, and chlorine demand in the raw water intakes located west of the mouth of the Ashtabula River in Lake Erie which supply drinking water to the City of Ashtabula. This degradation in raw water quality is attributable, in whole or in part, to the influence of the Ashtabula River. The company supplying water to the City of Ashtabula has monitored for organics in the raw water for over a decade. While organics such as PCBs, PAHs and HCB have never been detected in the raw water at the treatment plan, such monitoring is requested to be conducted at the mouth of Fields Brook and at the mouth of the Ashtabula River prior to, during, and for a reasonable period of time after completion of the Fields Brook remediation project to assure that the safety and quality of the City of Ashtabula's water supply is maintained in an uninterrupted manner. Representatives of U.S. EPA, OEPA, the City and the Water Company should meet to discuss monitoring locations and frequencies.

Response: Water from Fields Brook is not considered a source of drinking water in the area. Contamination from the Site has not been found in the City of Ashtabula's drinking water, Surface water samples were collected from the brook, river and harbor areas in the past. As a result of this sampling, it was determined that the City of Ashtabula's water supply in Lake Erie is not being contaminated by discharges from the Fields Brook. The surface water sampling conducted within the Ashtabula River in 1991 and in earlier years did indicate a few exceedences of chemicals regulated as U.S. EPA drinking water standards; however, no exceedences significantly above the drinking water standards were indicated. Also, since at least 1972, all operating industries which discharged a significant amount of water to Fields Brook or the Ashtabula River were and are required to test their discharge water frequently (e.g., usually either monthly or weekly, sometimes daily or continuously) and treat their discharges if necessary to ensure that the water is clean.

The City of Ashtabula receives its water from an area of Lake Erie which is almost always not impacted by Fields Brook and the Ashtabula River; the only potential impacts may occur during times of infrequent northeasterly winds. Public water systems of the size of Ashtabula's are required to monitor and test for various contaminants including most of the contaminants found in the sediments and soils in and around Fields Brook. This testing is done every three months. None of these monitoring samples have found any contamination associated with the Fields Brook Site. To help ensure protectiveness, the PRP group conducting work at the Site also tested the City's drinking water in 1992 at the intake point in Lake Erie and found no contamination in the water. Therefore, the City's drinking water was not found to be impacted by the Fields Brook Site, and is considered safe.

The proposed cleanup alternatives for the brook sediments and FWA soils will require collection and treatment of any wastewater generated during cleanup operations. The treatment requirements of this wastewater will be based in part on Ohio EPA's surface water discharge permitting requirements, and discharges will be regulated to ensure that the waters have been treated sufficiently to assure protection of human health and the environment. During construction activities, the soils and sediment areas of the brook and FWA which will be disturbed will be covered every evening. Actions will be taken to help ensure that releases of contamination will not occur, such as covering of disturbance areas with tarps, installation of silt fences in downgradient areas of brook construction to prevent releases of suspended sediments, and a three day limit for any brook sediment areas to be left exposed during stream rerouting. Also, the brook and FWA remedies will be conducted in segregated parts of approximately 100-200 foot lengths, to help ensure that large areas of disturbed soils are not left unprotected during rainstorms which may occur. Work will also stop if releases are indicated or if a rainstorm appears imminent. U.S. EPA believes these activities are sufficient to confirm the continuing lack of impact of dischargers from the Field Brook on the drinking water supply for the City of Ashtabula. Thus, additional sampling is not needed.

Regarding cleanup activities in the River, contamination found in Fields Brook sediment has been shown to have migrated into the river sediment and it may be necessary and appropriate to remediate those contaminants as part of the Fields Brook site Superfund remediation activities. A Public/Private Partnership known as the Ashtabula River Partnership (ARP) involving U.S.

EPA, U.S. Army Corps of Engineers, the State, City, local groups, local industries, local businesses, the County, and public officials was formally initiated in 1/94. The overall ARP goals are to restore beneficial uses by removing the River's contaminated sediments. The Superfund program is monitoring progress of the ARP, and if the ARP develops firm plans to address the contaminated sediments, then U.S. EPA may suspend or stop its Superfund-related studies associated with the Ashtabula River.

Comment: Sediment was recently taken out of the Ashtabula River and dumped into a landfill in the Township area. The landfill is still there. Is there going to be a new landfill located near that landfill? Doctors have said that the environmental air that we breathe can be coming from this particular area. The proposed location for the new landfill is near residences, and we don't want the landfill in our area or in the City of Ashtabula. Ashtabula County has become a dumping ground for toxic waste. PCB's have been dumped already on West 38th Street, and in the east side area.

Response: It is generally most cost-effective and environmentally safe to treat wastes on the site where the wastes were deposited or generated. For the Fields Brook site, this will be within the watershed area of Fields Brook. U.S. EPA considered all possible areas within the industrialized areas of the Fields Brook watershed as the preferred location for the landfill, since most of the residences and schools are separated from these areas. After considering all possible areas, U.S. EPA narrowed potential landfill locations to the Detrex, ACME and RMI Sodium facilities. The Detrex facility has a significant groundwater plume of contamination, and the ACME facility has significant amounts of debris and other contamination throughout the property, which would create difficulties with locating a landfill. The RMI Sodium property location would generally meet or exceed regulations for siting landfills. This location will provide at least a 2000 foot buffer from most of the residences in Ashtabula, and would not involve any construction in wetlands, areas of high groundwater, or surface water bodies. For these reasons, the preferred location at this time for the on-site landfill for the FWA soils to be excavated is on the RMI-Sodium facility, which is approximately one mile west of the landfill facility where the Ashtabula River sediments which were dredged in 1994 were brought.

The transport of sediments and FWA soils will be required to be conducted in a safe and clean manner. The trucks will have covers which will prevent dust releases or spillages during transport from the brook and FWA area.

Once landfilling occurs, dredged soils and sediments generally do not release a sufficient amount of gas to cause a human health concern. Once all of the dredged sediments and soils are brought to the landfill, the landfill is closed and covered with a thick layer of clean soil in part to prevent rainwater from entering the fill area. The landfill will also have a plastic layer incorporated within the cover, have a grass surface, have a fence surrounding the facility and have a series of plastic liners for leachate detection and collection. An anaerobic environment (i.e., without oxygen) will be created within the landfill which will hinder the release of gases from the fill material. The landfill will be monitored to assure it remains protective of human health and the environment. While there would be eventual release of gases which may build up over time within the dredged sediments, the rate of release is very low and thus would not likely cause a health problem to anyone who may be walking near the landfill. Also, the greatest chance of releases of gases from the dredged sediments is during excavation and transportation, because this is when the sediments are most exposed to the ambient air. During the Ashtabula River dredging of 1994, the air was tested around all construction activity areas in order to determine whether any hazardous substances were being released, and this testing did not indicate that any levels of hazardous substances above allowable health based levels occurred.

There is a possibility that there could be releases to the air during construction activities above acceptable limits for human health and the environment. Air monitoring during construction activities in the FWA and brook sediment areas will be conducted to help assure that no unacceptable levels of air contaminants are released during the cleanup. Air samples will be taken and analyzed at an approved laboratory; the U.S. EPA and OEPA will review the results of this sampling. The levels will be compared to short-term industry standards to ensure protectiveness, as well as to long-term calculated levels. If any unacceptable releases are found, cleanup activities would immediately be adjusted to prevent unacceptable releases of air contaminants.

The companies doing the cleanup work will collect the samples and monitor the actual operation. Government oversight will be conducted to help assure that the cleanup is operated safely and according to environmental regulations. Performance information will be made available to the public as soon as it is developed and verified.

<u>Comment:</u> Once the FWA remedy is completed, will the source of the contamination to the brook and FWA area be stopped? Why spend millions of dollars on cleaning up an area if it is going to be recontaminated in the future. I don't think there is any real assurance that the sources of contamination will be cleaned up.

Response: The Fields Brook Site investigations have found sources of potential recontamination to the brook sediments and FWA soils on several of the industrial properties surrounding the Brook. These areas of contamination are planned to be cleaned up over the next several years which will help ensure that the surface waters and FWA soils in the Ashtabula area will not become recontaminated in the future. Cleanup of these potential source areas will occur prior to or at the same time as cleanup of the FWA soils and Brook sediments, so that the Brook would not be recontaminated after the Brook is cleaned. Sampling will be conducted in various areas within the Brook and along the FWA soils after cleanup activities are conducted, in part to help assure that the Brook and FWA cleanups remain protective over time.

Comment: Although the backfill areas and cover areas will be revegetated over time after the cleanup occurs, before that vegetation is established, there will be a lot of erosion. Heavy equipment will compact the FWA soils which will change the FWA drainage patterns. Removing vegetation prior to excavation and cover activities will also leave no roots and other vegetation to hold the soil down.

Response: There is a potential for future erosion of the excavation and cover areas after cleanup activities occur. Also, it is expected that there will be some period of time needed before full revegetation of native plants occurs. Revegetation sequencing after remedial construction activities occur will include the initial establishment of grasses soon after construction activities to help prevent erosion of disturbed areas. These grasses are expected to ultimately give way to the establishment and regrowth of native vegetation after several years. Operation and maintenance (O&M) activities will also be regularly conducted and will begin soon after cleanup activities are conducted. All cover and backfill areas will be regularly inspected during O&M, and remedial response areas which may be eroding or not revegetating will be corrected.

Comment: Homes in the residential areas from Columbus west or State Road west may be contaminated with contamination from Fields Brook and the FWA. Cleaning up the FWA and the Brook is thus a waste of money, and these homes should be bought up and the whole area restricted from future access.

Response: For reasons noted below, U.S. EPA believes it is not necessary to purchase the approximately 40 residences next to Fields Brook between 16th Street and Route 11 in Ashtabula, the several homes next to the Brook near the Ashtabula River, and the several apartments and townhouses along the north side of Fields Brook between 16th Street and Route 11. There is no evidence that the portions of the backyards of these homes and residences which lie above the 100-year floodplain area of Fields Brook have been contaminated by Fields Brook. Further, a spread of contamination from Fields Brook to these immediate backyard areas of the homes along Fields Brook is not likely to occur. The FWA is generally topographically lower (i.e., 10-20 feet lower in height) than the immediate backyard lawn areas of the homes along the brook; these immediate backyard areas are significantly higher than the 100-year FWA and thus it is very unlikely that any contamination from the FWA area has reached the backyard areas due to deposition of sediment from rain events.

Comment: There is a lot of money available in Superfund. U.S. EPA should use the Superfund to clean up the site and not let special interest get in the way.

Response: Superfund enforcement requirements require that, on a Site-specific basis, the potentially responsible parties (PRPs), if identified, conduct the work at the Site. The PRPs have voluntarily conducted extensive studies for the FWA, and have indicated that they have spent close to $25 million thus far in investigation and design efforts associated with the FWA, brook, source areas surrounding the brook and the Ashtabula River. Although the PRPs have not yet signed agreements and settlement documents for conducting the cleanup construction activities for the FWA, brook sediments, and source areas of contamination of the Fields Brook site, U.S. EPA expects that these settlement agreements with the PRPs will be signed within the next year. U.S. EPA and OEPA will oversee the activities of the PRPs. During a PRP cleanup, the primary function of U.S. EPA and OEPA is to ensure PRPs comply with all applicable laws, regulations, and requirements, and meet all performance standards specified in the Settlement Agreement.

II. Comments to U.S. EPA's 10/96 Ecological Risk Assessment

Comment: EXECUTIVE SUMMARY, Paragraph 1, last sentence: The PRPs identified "ECUGs" only for the convenience of U.S. EPA. The PRPs believed, and continue to believe, that such goals are inappropriate objectives for risk management. Risk reduction objectives, rather than simplistic environmental media cleanup goals, are the most appropriate risk assessment standards for risk management.

Response: Identification of "ECUGS" does not imply that clean-up goals are the only objectives of risk management. ECUGS are used in combination with other risk reduction approaches to manage risk at a site. U.S. EPA normally develops remediation goals and remedial action objectives to address both human health and ecological risks which are identified. This is appropriate and necessary as part of cleanup decisionmaking at Superfund sites.

Comment: Paragraph 2, sentence 4: The PRPs ecological risk assessment employed appropriately conservative assumption and applied reasonable input values based on site-specific data. These assumptions and values were carried through appropriately in the conclusion of the U.S. EPA Region V baseline ecological risk assessment. In contrast, U.S. EPA-Edison risk assessment applies values which are technically inappropriate and which are not conservative, they are simply wrong. For example, U.S. EPA-Edison assumed that maximum contaminant levels represented exposure, that area use factors were universally 1, and that chemicals were 100% bioavailable. Such assumptions are only justifiable in a screening level risk assessment according to guidance (U.S. EPA 1994), and are not technically sound for more site-specific and comprehensive risk assessment. More complete and comprehensive risk assessment under the guidance is to be based on site-specific data and reasonable assumptions. Such data and assumptions were employed in the PRPs ecological risk assessment as reflected in the U.S. EPA Region V baseline risk assessment.

Response: The authors of the U.S. EPA-Edison risk assessment applied assumptions which were considered appropriate based on available data for the site. It was acknowledged that assumptions used in Edison's risk assessment were conservative. As indicated in the report, several reviewers considered the use of the conservative assumptions appropriate given the circumstances of available data and site condition.

Comment: INTRODUCTION, Page 1, paragraph 1, first bullet: The PRPs risk assessment is not included in this report. The PRPs document was revised by U.S. EPA, and U.S. EPA should be considered the author of the revised risk assessment.

Response: It is acknowledged that the original PRP risk assessment is not included in the final report; however, it has been provided to the Administrative Record of the Fields Brook site in its original and unrevised form. A revised ecological risk assessment based on the PRP document has been provided by U.S. EPA, and U.S. EPA did consider itself the author of this report.

Comment: Page 1, paragraph 1, third bullet: The PRPs did not "develop" ecological clean-up goals, and does not believe that such goals are appropriate for risk management. The PRPs provided ECUGs based on risk assessment findings at the request and for the convenience of U.S. EPA.

<u>Response:</u> Refer to the "ECUG" comment response above.

<u>Comment:</u> Page 2, paragraph 4, first sentence: The baseline ecological risk assessment report submitted by the PRPs in October 1995 is NOT "provided as Attachment I". Attachment I is a report prepared by U.S. EPA, incorporating numerous revisions to an electronic text file provided by the PRPs.

<u>Response:</u> It is acknowledged that the original PRP risk assessment is not included in the final report; however, it has been provided to the administrative record in its original and unrevised form. A revised ecological risk assessment based on the PRP document has been provided by U.S. EPA, and U.S. EPA did consider itself the author of this report.

<u>Comment:</u> Page 2, last paragraph, bullets ff to page 4: The second bullet identifies "probabilistic statistical approach" as an "unresolved issue". In practice, and according to draft agency-wide ecological risk assessment guidance (U.S. EPA 1996), probabilistic exposure estimates are technically sound and most appropriate.

<u>Response</u>: Current guidance on ecological risk assessment (U.S. EPA, 1996) acknowledges the potential application of probabilistic exposure estimate techniques such as Monte Carlo. Probabilistic exposure assessment may be used to estimate high-end, individual exposure at a site; this effort is needed to conduct the risk assessment. If sufficient information about the variability in lifestyles and other factors is available to simulate the distribution through the use of appropriate modeling, e.g., Monte Carlo simulation, the estimate from the distribution may be used. If only limited information on the distribution of the exposure or dose factors is available, the risk assessor should approach estimating the high-end by identifying the most sensitive parameters and using maximum or near maximum values for one or a few of these variables, leaving others at their mean values. In risk assessments where Monte Carlo analyses have been applied a range of exposure assumptions, including exposure frequency and duration, are created. The Monte Carlo approach then develops a distribution from each of these individual parameters, which may be artificial, then generates a final risk distribution considering all input parameters. The value of Monte Carlo simulations in estimating exposure or risk probability distributions diminishes sharply if one or more parameter value distributions are poorly defined or must be assumed. The U.S. EPA ecological risk assessment guidance also identifies several potential concerns in application of such models. Use of probabilistic models are not always "most appropriate" and were not considered appropriate for this study. U.S. EPA's 4/18/95 letter to the PRPs responded to

the PRP's proposal to use probabilistic techniques within the FWA ecological risk assessment; this 4/18/95 letter is provided as an attachment to the U.S. EPA 10/96 Human Health Risk Assessment for the FWA.

Comment: Page 2, last paragraph, fourth bullet: This bullet identifies use of fish tissue from upstream locations to estimate "current" risks to mink and heron. In fact, such a use was never made of these data. The PRPs were committed to remediation of the brook sediments prior to conducting the ecological risk assessment. Therefore, species potentially exposed via brook components of the overall ecosystem in the context of the floodplain wetland would only be exposed to post remedy concentrations. The floodplain wetland ecological risk assessment has no role in determining cleanup criteria for brook sediments.

Response: Comments on the use of upstream fish tissue are unclear. If data on upstream fish tissue concentrations were not used to estimate current risk, than the risk assessment document failed to fully characterize current risks to on-site receptors which may consume aquatic organisms. The fish data was used in part to calculate HQ's. U.S. EPA had previously noted that use of the upstream areas of Fields Brook (Area 4) as a reference area for comparisons of HQ values remains questionable, in part because previous chemical spills may have occurred in this area, because fish swim up and down the stream and would be in contact with downstream contamination, and also because calculated HQ values from the originally selected reference areas at nearby streams (Red Brook and Whitman's Creek) could have been utilized for comparisons.

Comment: Page 3, first full paragraph, last sentence and elsewhere: Repeated characterization of the database employed by U.S. EPA for ecological risk assessment as "questionable" is unnecessarily vague. Throughout the report, U.S. EPA should identify clearly and quantitatively the weaknesses believed to exist in the information base and state the effect of these weaknesses on the certainty with which risk assessment conclusions are drawn. It is important to note that, in contrast to statements made in U.S. EPA's baseline risk, a large data base on site-specific chemical concentrations including measurements in plant tissue, mammals, and invertebrate, has been obtained to reduce assessment uncertainty.

Response: Previous comments provided by other reviewers of the original risk assessment report identified areas of concern regarding data quality. In its comments to the PRPs ecological risk assessment, U.S. EPA also identified weaknesses in the data quality. For example, compositing across several different species in determination of small mammal tissue concentrations were identified as an issue of potential concern in data interpretation. Also, U.S. EPA expressed concerns regarding odd data distributions and truncations which are not justified or adequately described. U.S. EPA also expressed concerns regarding interpretations of data presented in such a way as to downplay the results of tests (earthworm toxicity tests) and presentation and interpretation of statistical tests (composite biota samples).

Comment: Page 3, second full paragraph, last two sentences: Compositing of Phase II samples is not justification for employing highly uncertain and biased conservative input assumptions. All Phase III samples were individual organisms where appropriate, and there are no discernible differences between these samples and the Phase II composites, indicating strongly that concern for potential to "obscure" elevated contaminant concentrations is misplaced. In addition, Phase II samples were composited (to make analytical mass threshold requirements) only within species and trophic guilds. All tissue measurement data employed in the risk assessment are scientifically sound, and examination of these data indicates that nothing is "obscured" by their application.

Response: Compositing of tissue samples was identified as one source of potential uncertainty in the U.S. EPA-Edison risk assessment. Other sources of potential uncertainty were also identified within the report including the lack of species specific toxicity information. U.S. EPA's general practice is to err on the side of caution regarding use of uncertain data; these uncertainties are justification for the use of the conservative input assumptions.

Comment: Attachment 1, Authorship: This attachment was prepared by U.S. EPA, not by EA Engineering, Science and Technology. U.S. EPA modified an electronic text file prepared by consultants to the PRPs, and is the sole author of this attachment.

Response: Acknowledged.

Comment: Page x, last sentence: It would be helpful to have citations for this statement, rather than the generalization that the application is "suggested by some authors" with no identification of the scientific sources.

Response: The 'other authors' in question are more accurately identified as previous reviewers to the risk assessment document, including U.S. EPA and Ohio EPA.

Comment: Page 36, sections 5.1.9 and 5.1.10, last sentence of each: As discussed in comment for Page 3, second full paragraph, last two sentences above, compositing did not affect data quality negatively, and in fact allowed application of high mass analytical methods for Phase II data for comparison with individual samples analyzed by low mass methods in Phase III. Because compositing clearly had no negative effect on data quality, there is no justification on this basis for highly uncertain and biased input assumptions.

Response: As indicated previously, use of conservative input assumptions was based on several uncertainty factors, including the use of composited samples. It is not readily apparent that "compositing clearly had no negative effect on data quality" as suggested by the reviewer.

Comment: Attachment 2, Page 2, paragraph 1, second sentence and elsewhere: Statement that "...very little data on the extent and magnitude of contamination in the area was available to conduct this risk assessment..." is repeated elsewhere (for example, on page 12), and is apparently used to justify the scientifically untenable assumption that maximum measured chemical concentrations appropriately represent ecological exposure. In fact, hundreds of samples of sediments and biotic tissue have been taken on the floodplain wetland, and have been reported in appropriate detail in project reports. This data, rather than inappropriate assumption of measured maximum, should have been employed to represent ecological exposure.

Response: The U.S. EPA-Edison risk assessment document was provided in its entirety as an attachment. Authors of U.S. EPA-Edison assessment evaluated the data available at that time and utilized the data as was considered appropriate. In its comments to the PRPs ecological risk assessment, U.S. EPA identified several weaknesses in the data quality.

Comment: Page 13, section 9.0: Cleanup goals based on maximum site chemical concentrations will clearly lead to over-remediation, with associated needless habitat destruction and impact of remedy. Given the large data base on the distribution of chemicals in the floodplain wetland and the detailed reporting by location provided in project documents (for example, in the RI report), use of maximum concentrations in this calculation is inappropriate and unnecessary.

Response: Refer to the "ECUG" comment response above.

Comment: Page 14, second full sentence: It is unclear why the statement was made that "No site-specific data was [sic] available for levels of COCs in plants or terrestrial invertebrates". A number of site-specific measurements of tissue concentrations in plant tissue and earthworms were made and reported. This data should have been used to derive site-specific BSAFs, if needed for the risk assessment, rather than employing the generic and inappropriate assumption that BSAFs equal 1.

Response: It is acknowledged that site-specific tissue data did not appear to be used to estimate contaminant concentrations at upper trophic levels in the U.S. EPA-Edison risk assessment. Authors of the original U.S. EPA-Edison assessment considered the data inappropriate for that application, in part because the data was not complete enough to make conclusions for the entire wetland and in part because of concerns raised regarding data quality.

III. Comments to EPA's FWA Human Health Risk Assessment:

Comment: The FWA risk assessment follows a previous risk assessment done for the Fields Brook SOU, where PCB cancer risks were assessed with a cancer slope factor of 7.7, and PCB non-cancer risks were assessed with an RfD of 1×10^{-4}. At the time of the SOU risk assessment, IRIS listed a CSF of 7.7, while no RfD for PCBs was given. The RfD used in the Fields Brook SOU risk assessment was recommended by U.S. EPA Region V, and was based on a study of Aroclor 1016 in rhesus monkeys. Many PCB studies have been completed since the SOU risk assessment, and IRIS now lists a revised CSF of 2.0 (high end of a recommended range). There remains no RfD for PCBs, however ATSDR recommends a minimum risk level (MRL) of 2×10^{-5}, based on Aroclor 1254. The change in the CSF has the effect of reducing estimated cancer risks, while the change in the RfD has the effect of increasing estimated noncancer risks. U.S. EPA does not consider the revised CSF in calculating cleanup goals, which would have decreased risks and raised the cleanup goal, but they do consider the revised RfD, which increases risks. U.S. EPA does this despite the fact that the new CSF is listed on IRIS, while significant doubt remains about the RfD. As a result, the FWA risk assessment contains an unfair bias because U.S. EPA has failed to accept a valid scientific basis for a change in the toxicological factor if it leads to a decreased risk.

Response: This issue relates to how U.S. EPA accounted for the new cancer slope factor of 2.0 vs. the former cancer slope factor of 7.7 to derive the cleanup goal for PCBs. As noted in the Risk Assessment, U.S. EPA calculated two separate cancer risk CUGs for PCBs, one set of CUGs based on the revised and current CSF and one set based on the former CSF. The recently revised CSF of 2.0 results in PCB cancer risk CUGs of 1.2 ppm on average in statement was made that "No site-specific data was [sic] available for levels of COCs in plants or terrestrial invertebrates". A number of site-specific measurements of tissue concentrations in plant tissue and earthworms were made and reported. This data should have been used to derive site-specific BSAFs, if needed for the risk assessment, rather than employing the generic and inappropriate assumption that BSAFs equal 1.

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Upon consideration of the various issues associated with PCB risks at the Fields Brook site, U.S. EPA has made a risk management decision and has set the total PCB CUGs for the floodplain/wetlands operable unit as follows: 1 ppm on average in residential areas, 6 to 8 ppm on average in industrial areas. These FWA PCB CUGs are slightly lower in concentration than CUGs based solely on the recently revised CSF, and slightly higher than CUGs based solely on the former CSF. These FWA PCB CUGs are based on U.S. EPA's risk management decision to be protective of ecological receptors at the site, and to attempt to be protective and account for the uncertainties regarding the endocrine disrupter health effects. Also, this decision reflects U.S. EPA's attempt to account for the potential synergistic effects of the multiple contaminants in the FWA which may increase health risks associated with the predominant chemical of concern in the FWA, which is/are PCBs.

Regarding the need to be protective of ecological receptors at the site in developing the FWA PCB CUGs, the 1986 FWA Ecological Risk Assessment indicated the potential for significant risks to ecological populations associated with exposure to PCBs. It should be noted that a FWA remedy which meets the total PCB CUG of 1 ppm on average in residential areas and 6 to 8 ppm on average in industrial areas. may still result in chronic hazard quotients (HQs) which exceed a value of 1 for several species (as noted in the 10/96 FWA Feasibility Study, Appendix 1), and that HQs above 1 may indicate a risk of adverse effects to species. However, U.S. EPA believes that an FWA remedy which meets the above noted PCB CUGS would protect the various populations of ecological receptors which exist or may exist within the floodplain area for this site. The response actions would reduce the short- and long-term risks to ecological populations and reduce these population's potential uptake of contamination via soil and food to acceptable levels of exposure. It should also be noted that the HQ calculations were developed using conservative assumptions which would help provide for protectiveness to ecological receptors.

Regarding the need to attempt to be protective and account for the uncertainties regarding the endocrine disrupter health effects in developing the FWA PCB CUGs, it should be noted that although the PCB cancer risk slope factor changed based on the final reassessment report of September 1996 from 7.7 to 2, as noted within the 1996 Human Health Risk Assessment, at this time there is no agreed-upon quantitative method within U.S. EPA to incorporate the endocrine disruption data into a toxicity value. There is reason to believe that the endocrine disrupter effect may be the most sensitive health effect of PCB exposure. Also, U.S. EPA's general practice is to err on the side of caution regarding use of uncertain data; the endocrine disruption uncertainties provide justification for the use of a conservative PCB cleanup goal calculation.

This decision is also supported by the 12/96 "Public Health Implications of PCB Exposures" article prepared by the Agency for Toxic Substances and Disease Registry and U.S. EPA. This study indicates that exposure to PCBs in the Great Lakes area appears to cause disrupt reproductive functions, cause neurobehavioral and developmental deficits occur in newborns which continue through school age in children, and result in developmental problems such as abnormally weak reflexes, greater motor immaturity and less responsiveness to stimulation.

Also, as indicated in U.S. EPA's 10/22/96 article entitled "PCBs: Cancer-Dose Response Assessment and Application to Environmental Mixtures", there are a number of uncertainties associated with the effects of how environmental processes alter PCB mixtures after release into the environment, and the resultant uncertainties associated with assessing risks posed by different environmental mixtures once released. The report indicates that among the exposures associated with greatest toxicity and persistence after release into the environment include ingestion of contaminated sediment or soil, which is the primary human exposure route associated with the FWA.

Comment: Pages 4-3 and 5-3: Section 4.3.1 concerning toxicity values for PCBs states that the cancer slope factor is 2.0. While this is a true statement, it is misleading because U.S. EPA used the old cancer slope factor of 7.7 to derive the cleanup goals.

PCB cancer risks were inappropriately calculated using the former cancer slope factor of 7.7 $(mg/kg\text{-}day)^{-1}$. It was acknowledged in the risk assessment that a new range of cancer slope factors has recently been established for PCBs, but these new values were not used. No scientific justification was provided to explain why the former cancer slope factor was chosen instead of the recently reassessed value.

In the risk assessment report, it is noted that the former cancer slope factor of 7.7 $(mg/kg\text{-}day)^{-1}$ was based on studies using Aroclor 1260. The recent PCB reassessment was described as a "joint consideration of cancer studies and environmental processes [...] supported by several complimentary sources," perhaps implying that the reassessed values are less valid. In fact, the upper bound slope of 2.2 $(mg/kg\text{-}day)^{-1}$ calculated in the recent PCB reassessment is based on the same rat study (Norback and Weltman, 1985) as the former value of 7.7 (mg/kg-day)$^{-1}$; the reassessment simply corrected three errors that had been made in the development of the 7.7 value. Specifically, the revised value took into account a 1991 reevaluation of the tumor histopathology data, a new U.S. EPA cross-species scaling factor, and initial instead of time-weighted doses.

The statement "There is some evidence that mixtures containing more highly chlorinated biphenyls are more potent inducers of hepatocellular carcinomas in rats than mixtures containing less chlorine by weight," (pg. 5-3 of the risk assessment) was an early hypothesis, but has not been supported by more recent data. Based on information summarized in U.S. EPA's 1996 PCB reassessment report, there is little if any evidence of a consistent relationship between chlorination levels and cancer potency. Aroclor 1016 (41% chlorinated) is much less potent than Aroclor 1242 (42% chlorinated), and analytical methods cannot reliably distinguish the two mixtures in environmental samples. Also, Aroclor 1254 (54% chlorinated) is more potent that Aroclor 1260 (60% chlorinated) in female rats in the recent carcinogenicity study sponsored by General Electric. It is likely that the cancer potency is far more dependent on the concentrations of particular congeners. Unfortunately, the relative importance of each congener is only beginning to be characterized.

Response: Cancer risks were calculated using both the 7.7 and 2.0 cancer slope factors, and for risk management reasons (discussed in the previous comment response) U.S. EPA has decided to use a more conservative PCB CUG than would be calculated based solely on the recently revised cancer slope factor of 2.0. We are in agreement with Woodward-Clyde that the new cancer slope factors reflect considerable effort by individuals in U.S. EPA and has resulted in an improved interpretation of data on the ability of PCBs to cause cancer. As regards to relative toxicity of variously chlorinated PCB congeners, the comment is accepted. It was agreed upon by both U.S. EPA and the PRPs during meetings in 1994 and 1995 to consider all of the Aroclor's and congeners together as total PCBs in the risk assessment.

Comment: Page 4-4: The text (pgs. 4-4 and 6-5) notes that endocrine disrupter effects "may be best modeled as linear and non-threshold," and that they "could theoretically be calculated in a manner similar to the cancer slope factor." We disagree. Although the precise mechanisms of endocrine disruption are not well known at the present time, the dose-response relationship for PCB endocrine disrupter effects is likely to have a threshold, similar to developmental and systemic effects induced via other mechanisms. Linear, non-threshold models are only appropriate for compounds that are thought to induce cancer by directly causing DNA mutations; endocrine disruption is not believed to involve mutagenesis.

Response: The concept of how best to model toxicity mediated via endocrine disruption is controversial and the scientific data are incomplete. It is therefore unclear whether these effects will ultimately be modeled by assuming a threshold or by assuming a linear, non-threshold model. There are reasons to believe, however, that perturbations of a complex system such as the endocrine system (or the interacting endocrine, immunological and neurological systems) will be non-threshold and incremental.

Comment: Page 6-4: There are several problems with the discussion of uncertainty associated with the PCB cancer slope factor on page 6-4 of the risk assessment. A significant problem is that only the draft PCB reassessment (January, 1996) is discussed. Since several changes were made in the final reassessment report (September, 1996), this discussion should be updated to reflect U.S. EPA's final recommendations. For example, while the draft reassessment recommended a specific adjustment to the exposure duration to reflect the persistence of PCBs in the body, the final reassessment recognized potential concerns about persistent PCB congeners but did not recommend a quantitative adjustment. Also, it is incorrectly noted on page 6-4 that "the new document describes PCB cancer potency using two ranges ..." [emphasis added]. In fact, while the draft reassessment recommended two ranges, the new, final reassessment recommended a total of six values - both a central and upper-bound slope value for three reference points (" high risk," " low risk," and " lowest risk"). Lastly, it is incorrectly noted in the risk assessment report that the draft document included guidance on the application of a cross-species scaling factor. While both the draft and final reassessment reports incorporated a cross-species scaling factor when modeling slope estimates, it was not recommended that risk assessors apply an additional cross-species scaling factor when assessing PCB cancer risks.

Response: Comment accepted; since the results and summary of the risk assessment will not substantially change as a result of this comment, in part for reasons noted above in the comment responses to the cancer slope issue, the FWA Human Health Risk Assessment. does not require change.

Comment: Page 6-5: In the risk assessment, it was stated that "It is likely that the risk calculated from either of the cancer slope factor underestimates actual risk from the site". We strongly disagree with this statement. While there are numerous sources of uncertainty in PCB risk estimates (including endocrine disrupter effects), numerous conservative assumptions are used so that the results represent upper bound risk estimates. For example, it is noted in the Risk Assessment Guidance for Superfund (RAGS) (U.S. EPA, 1989) that cancer risk estimates based on linear cancer models and an upper 95th percentile confidence limit "will generally be an upper bound estimate. This means that U.S. EPA is reasonably confident that the true risk will not exceed the risk estimate derived through use of this model and is likely to be less than that predicted." This fact is even noted in Table 7 of the U.S. EPA Fields Brook risk assessment.

Response: The cancer risk is an upper bound estimate of risk and therefore likely overestimates calculated cancer risk. However, the statement in question was meant to reflect the entire scope of PCB toxicity including endocrine disruption effects. In addition, the statement was intended to represent the limitations in the risk assessment due to an inability to calculate a risk for these more subtle endpoints.

Comment: Table 7: We have several concerns with the discussion of general uncertainty factors in Table 7. It is misleading to represent many of these uncertainty factors as "over- or underestimating risks," implying that each possibility is equally likely, when in fact, they are far more likely to overestimate risks. By definition, toxicity factors (slope factors and reference doses) are designed to err on the side of overestimating risks. For example, even though it is theoretically possible that humans could be more sensitive to PCBs than animals, an uncertainty factor is incorporated into toxicity values to specifically account for this possibility. Furthermore, despite large numbers of PCB-exposed workers, PCBs have not been causally associated with cancer in humans based on epidemiology data. Another example is linear extrapolation from high doses to low doses. This approach will only underestimate risks if the dose-response relationship is superlinear (which has never to our knowledge been suggested for PCB carcinogenicity).

Response: U.S. EPA partially agrees with this comment. Safety factors are intended to overestimate risk and should be stated as such. High dose to low dose extrapolations tend to overestimate risk and should be noted as such. U.S. EPA disagrees about the animal to human extrapolation. There is a great deal of uncertainty in such an extrapolation and that uncertainty may over- or underestimate risk.

Comment: Page 3-5: The U.S. EPA risk assessment is overly-critical of the exposure survey conducted by the PRPs, and states that "...the survey did not focus upon those individuals who reside along Fields Brook and thus does not accurately represent the population whose exposure to the brook is most of concern." This is not the case. The survey area is bounded by portions of East 14th Street, Columbus, East 15th Street, Route 11, East 23rd Street, and East 21st Street. Of the 100 households that were surveyed within this area, 40 of them are on property directly adjoining Fields Brook. The other 60 households, while not adjoining Fields Brook itself, include those across the street from the brook, and within this small defined area. U.S. EPA's assertion, that the survey did not focus on households likely to be exposed to the brook, is false.

Response: U.S. EPA does not believe it was overly critical of the PRPs survey; the several significant concerns regarding the survey are summarized in the FWA Human Health Risk Assessment. In addition to concerns noted in the Risk Assessment, U.S. EPA is concerned that the PRP's survey inappropriately disregarded hunting and fishing as a frequent activity along Fields Brook. During 1993 and 1994 discussions with the PRPs, U.S. EPA expressed concern that this conclusion did not consider that these other streams are not in close proximity to their residence (i.e., in their backyards), and disregarded the circumstantial evidence of frequent use discussed above (e.g., hiking, campfires, play). Further, the survey did not address the issue of children's exposure.

Comment: Page 6-3: The text incorrectly states that "The [PRPs] proposed that the size of the FWA exposure units be larger than those used in this risk assessment; that is, they proposed that a smaller number of exposure units be demarcated within the FWA for evaluation." This statement is false. The PRPs initially proposed that the FWA exposure units correspond to the SOU exposure units, and U.S. EPA accepted this proposal.

Response: The PRPs raised concerns regarding the length and total area of the FWA exposure units being considered by U.S. EPA in its 9/19/94 comments to U.S. EPA, including whether separate FWA exposure units existed on both sides of Fields Brook. U.S. EPA's 10/20/94 letter to the PRPs noted that it was appropriate to divide the FWA into the same ten exposure units that were previously used for Fields Brook sediment. U.S. EPA also noted that because separate populations exist on each side of Fields Brook, separate exposure units must be considered on each side of the ten exposure units. The PRPs continued to disagree with U.S. EPA's designation of separate FWA exposure units on each side of Fields Brook into early 1995.

Comment: Page 4-5: Section 4.3.8 concerning arsenic toxicity cites a cancer slope factor of 1.75. This value is out-of-date. The correct value of 1.5 is given in Table 5. It is unclear which value was used in the risk calculations.

Response: As shown in Appendix D, the calculation spreadsheets, the updated value of 1.5 was used in the risk calculations. The value of 1.75 given in section 4.3.8 was inadvertently in error.

Comment: Table 3: This table contains typographical errors; it is not clear to what extent, if any, these errors affect the risk calculations. The errors include:

Comment: FEU2, maximum concentration of PCE should be 2500 µg/kg

Response: Acknowledged. As the exposure point concentration is the lower of the maximum and the 95% UCL the risk calculations are not affected.

Comment: FEU2, maximum concentration of 1,1,2,2-Tetrachloroethane should be 580 µg/kg

Response: Acknowledged. As the exposure point concentration is the lower of the maximum and the 95% UCL the risk calculations are not affected.

Comment: FEU2, basis for exposure point concentration for PCBs should be listed as 95% UCL

Response: Acknowledged. The 95% UCL value was used in the risk calculation.

Comment: FEU8, maximum concentration of hexachlorobenzene should be 480,000 µg/kg

Response: Acknowledged. As the exposure point concentration is the lower of the maximum and the 95% UCL the risk calculations are not affected.

Comment: FEU8, 95% UCL on mean and exposure point concentration for hexachlorobutadiene should be 1900 µg/kg.

Response: Acknowledged. This revision lowers the calculated hexachlorobutadiene carcinogenic risk of 3.6 E-08 to 8.66 E-09, and the hazard index from 0.0046 to 0.001. The revision does not change the overall FEU8 carcinogenic risk of 1.1E-04, and hazard index of 1.4.

IV. Comments to the "Development of the Cleanup Goals (CUGs)" Section of the EPA's FWA Human Health Risk Assessment

Comment: Page 3 bottom through page 4 top: This text states that the CUGs were developed for the FWA by considering only the soil ingestion exposure route; that dermal exposure was not considered in developing CUGs. This statement is false. Both the PRPs and the U.S. EPA risk assessments considered both soil ingestion and dermal exposure, and both were used in U.S. EPA's development of the CUGs.

Response: Comment accepted. The CUG and risk calculations were properly conducted and considered both soil ingestion and dermal exposure, and thus no change to the risk assessment text is required.

Comment: page 5 top: This section appears to state that CUGs were developed for the FWA in 1993. However, the risk assessment was not done until 1995 (PRPs risk assessment) and 1996 (U.S. EPA risk assessment), and this 1996 U.S. EPA risk assessment is the first document that contains CUGs.

Response: U.S. EPA submitted a list of FWA CUGs to the PRPs on 10/20/94, and this list is provided as an attachment to the 1996 EPA Human Health Risk Assessment. These 10/94 CUGs are the current CUGS for the FWA.

V. Comments to the FWA Remedial Investigation Report

Comment: The Remedial Investigation Report for the FWA provides a general overview of the site chronology, activities completed and analytical data collected. There are some minor inconsistencies that should be noted regarding the following: use of the term operable unit for the FWA, description of FEUs (Floodplain Exposure Units) vs. EUs (Sediment Exposure Units), and analytical parameters obtained during FWA studies. Overall, the report references and summaries information provided in deliverables prepared by Gradient, EA Engineering and Woodward-Clyde.

Response: U.S. EPA considers the FWA a separate operable unit of the Fields Brook site. Regarding use of the terms FEU's vs. EU's within this report, unless otherwise noted within the report, both of these terms refer to the floodplain area exposure units under discussion.

Comment: Page 1-1: The text notes that U.S. EPA has divided the site into four areas of concern, three of which are considered "operable units" associated with the Fields Brook Superfund Site. The text incorrectly describes the operable units. The 1986 SOW originally described two operable units, the Sediment Operable Unit (SOU) and the Source Control Operable Unit (SCOU). The Floodplain and Wetland Area (FWA) has never been officially designated or referred to as an operable unit by the PRPs. The PRPs voluntarily proceeded with FWA sampling, risk assessments and feasibility study alternatives beginning in 1994.

Response: U.S. EPA considers the FWA a separate operable unit of the Fields Brook site, and no separate formal designation is required by U.S. EPA in order to refer to the FWA as such.

Comment: Figure 1 does not accurately depict the SOU and FWA investigation areas. The Source Control Operable Unit is not shown.

Response: The figure provides the reader with the general areas involved in the SOU, FWA and Source Control investigations. However, due in part to photocopying losses in clarity, the reader may have difficulty in deciphering and segregating these different areas.

Comment: Page 2-3: Section 2.1.2 discusses SCOU activities and indicates that all field work was completed in the Fall of 1995. The text does not reference the completion of a Feasibility Study (FS) that identified remedial alternatives that were developed for the remaining source control areas that represented potential recontamination sources to Fields Brook.

Response: Comment accepted; since this paragraph is intended to provide the reader with an overview of progress at another operable unit, the text does not require change.

Comment: Page 2-4: Section 2.1.4 refers to the Floodplain/Wetlands Area Operable Unit. This reference is incorrect.

Response: U.S. EPA considers the FWA a separate operable unit of the Fields Brook site.

Comment: Page 3-2: The text describes groupings of FEUs for residential and industrial land use areas. There appears to be some confusion regarding actual designation of FEUs (floodplain exposure units) and Eus (sediment exposure units). The listing provided describes exposure units (Eus) for the sediment operable unit and incorrectly describes the residential and industrial Eus. The designation break for residential and industrial FEUs in the FWA was Route 11 and in the SOU was State Road. In the SOU, residential Eus included: Reach 1, 2-1, 2-2, 3, 4, 11-1, 11-2, 5-1, and 5-2. and in industrial Eus included 11-3, 1-4, 6, 7-1, 8-1, 8-3, 8A, 13-1, 13-2, and 13A.

Response: The above statement is correct regarding designations of reaches of Fields Brook into FWA vs. brook sediment exposure units. However, regarding use of the terms FEU's vs. EU's in this report, unless otherwise noted within the report, both of these terms refer to the floodplain area exposure units under discussion, and the reaches identified on pages 3-2 and 3-3 of the FWA RI report correctly designate which reaches of the FWA are considered residential vs. industrial use.

Comment: Page 3-2: It should be noted that the FWA project only considered response areas in residential areas (FEU 2 and 3) and industrial areas (FEU4, 6, and 8).

Response: This report is an RI report which discusses the nature and extent of contamination and history of the site; response area discussions are provided within the FWA FS report.

Comment: Page 3, section 3.3, Figures: The figures provided in the RI (Figure 3 through 7) that identify Phase I, II, and III Floodplain Sample Locations depict the proposed locations as shown in the Work Plan. They do not show actual surveyed locations and minor sample numbering modifications that occurred during field sampling. Figures showing final sampling locations that were surveyed to exact locations were provided in the October 1996 Feasibility Study.

Response: Comment accepted; since these figures are intended to provide the reader with a general overview of sampling locations, the report does not require change.

Comment: Page 3-4: In the second full paragraph, the text indicates that all samples were analyzed for the 130 chemicals. This is not correct. The 137 samples collected during Phase III were only analyzed for the 11 COCs identified for the FWA (1,1,2,2 tetrachloroethane, tetrachloroethene, trichloroethene, vinyl chloride, benzo(a)pyrene, hexachloroethane, hexachlorobenzene, hexachlorobutadiene, arsenic, beryllium, and PCBs).

Response: Comment accepted; since the results and summary of the data summary writeups do not substantially change as a result of this comment, the report does not require change.

Comment: Table 2: The source of the summary analytical data tables included in this appendix was not referenced. The PRPs provided U.S. EPA with electronic files. It is assumed that data provided in these summary tables is consistent with the PRPs database.

Response: This comment makes a correct assumption; the report does not require change.

Figure 1: Fields Brook Superfund site

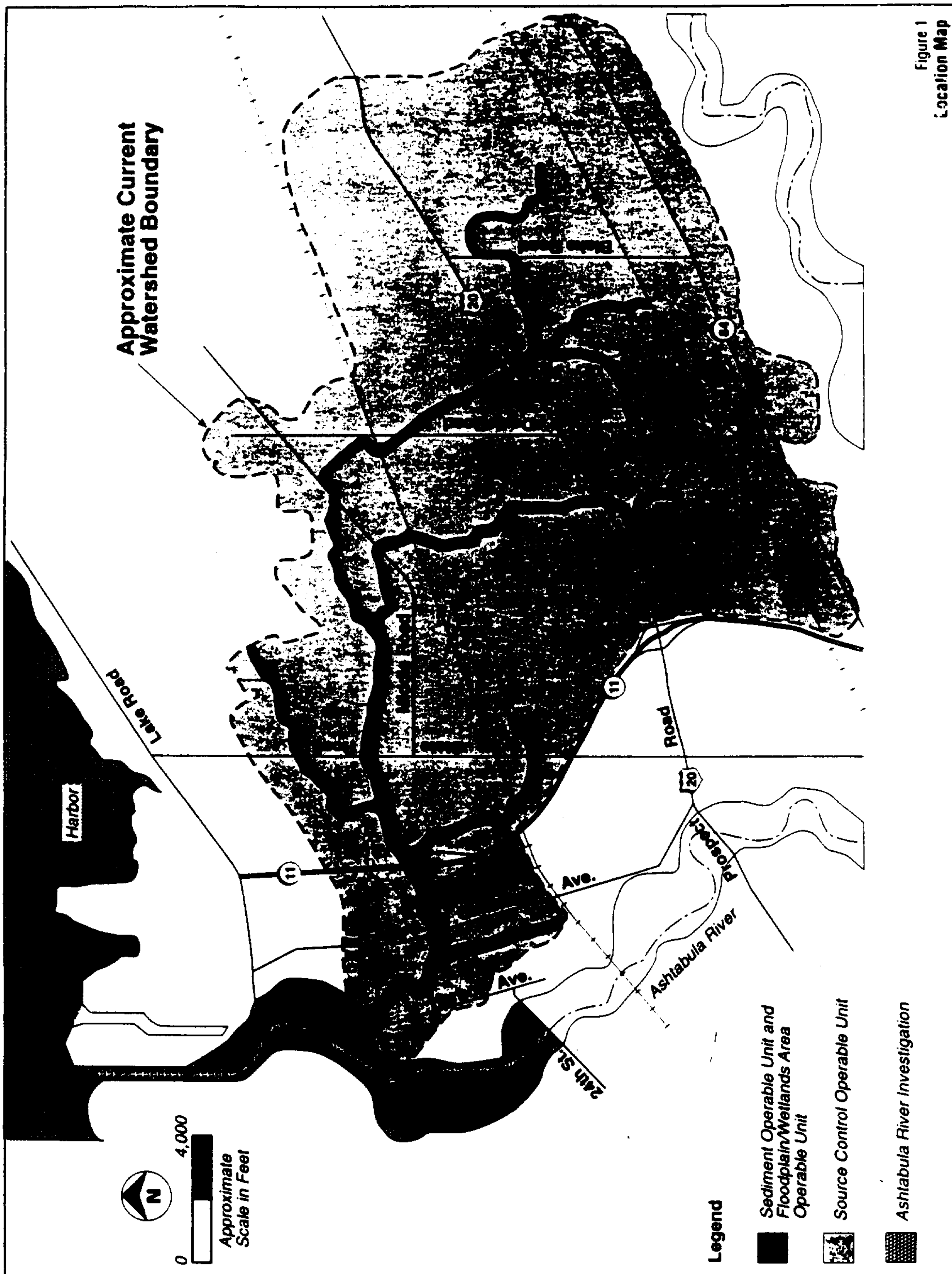

Figure 2: Reaches and Exposure Units of Fields Brook

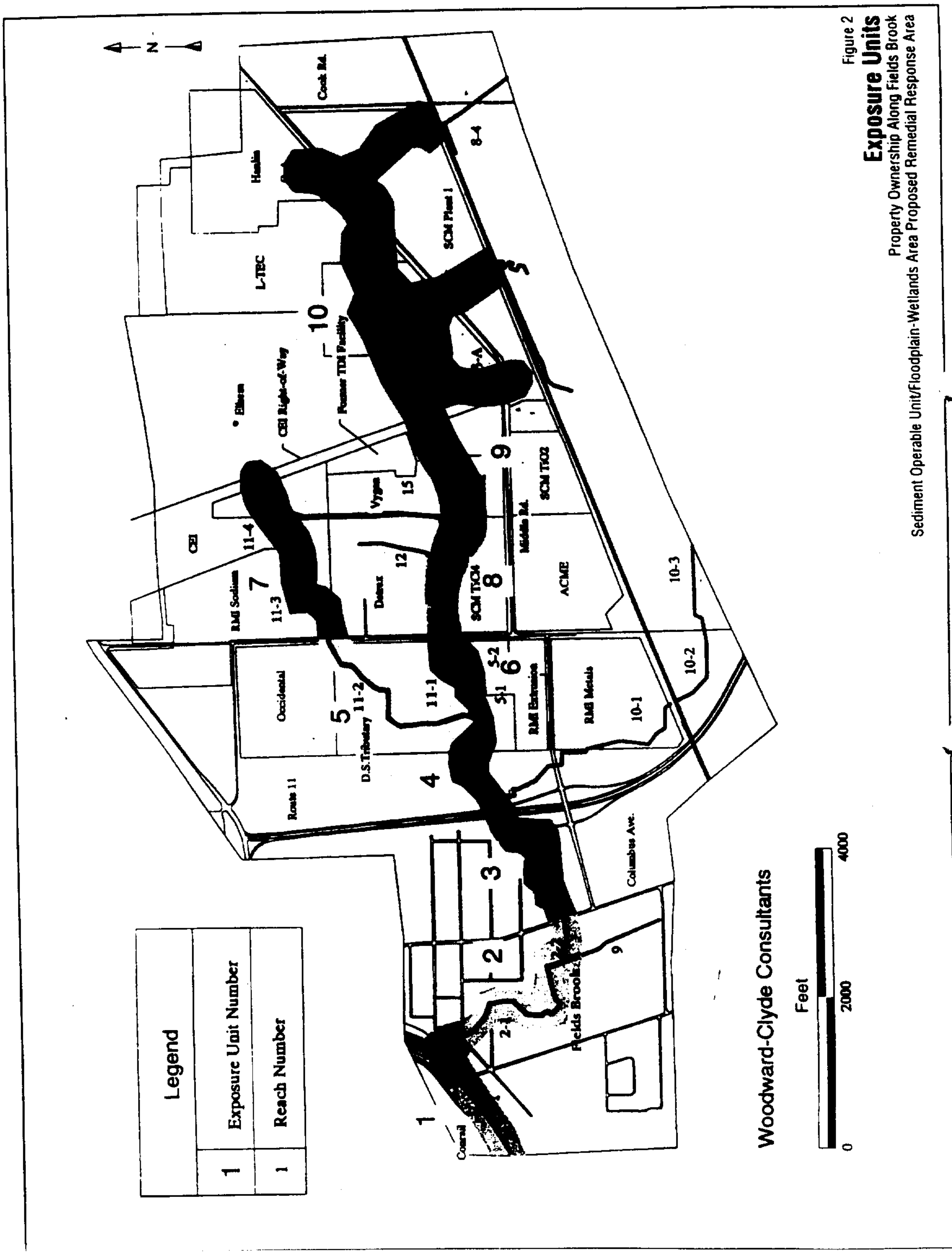

Figure 3: FEU 2-A Response Areas

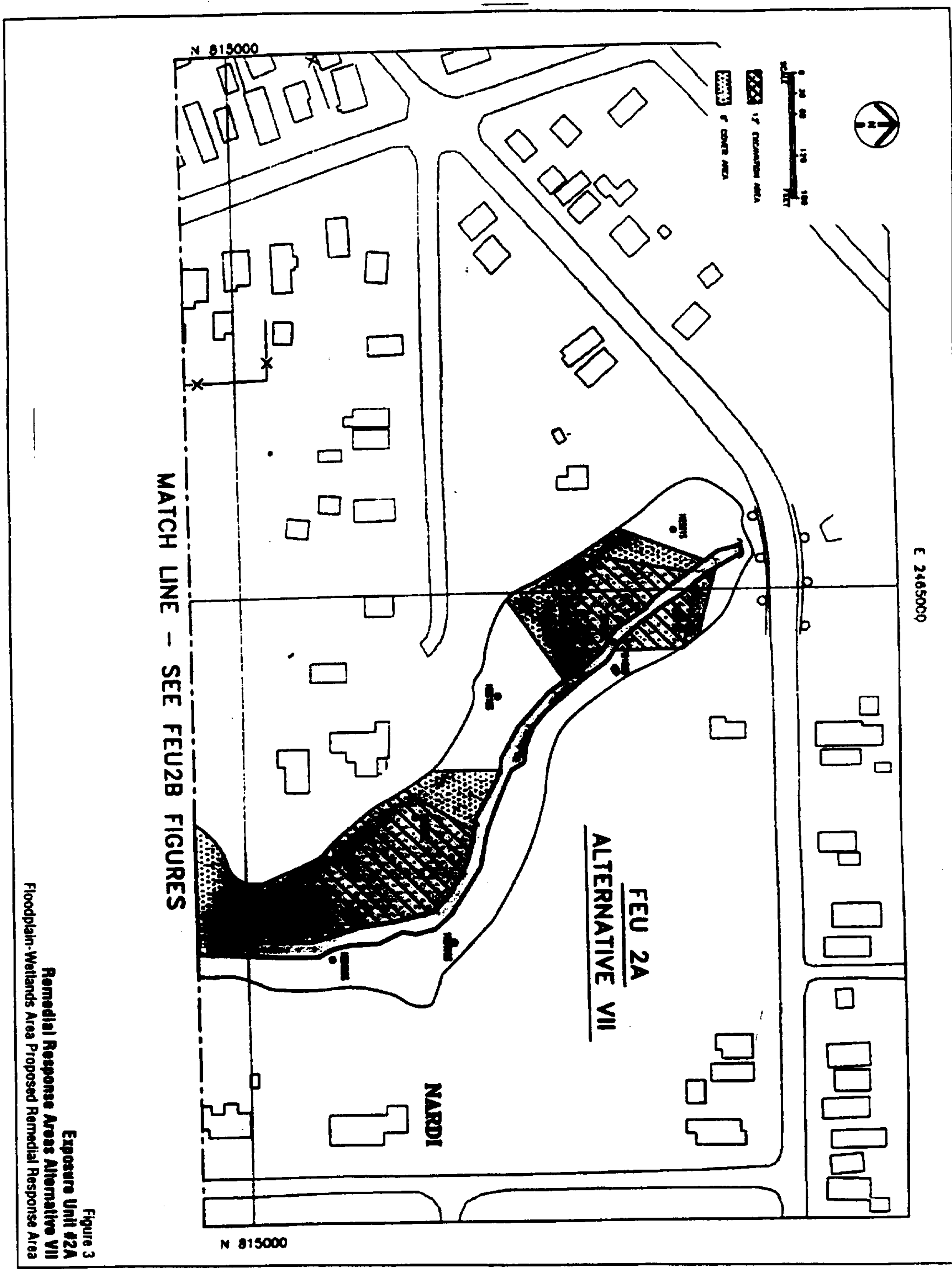

Figure 3
Exposure Unit #2A
Remedial Response Areas Alternative VII
Floodplain-Wetlands Area Proposed Remedial Response Area

Figure 4: FEU 2-B Response Areas

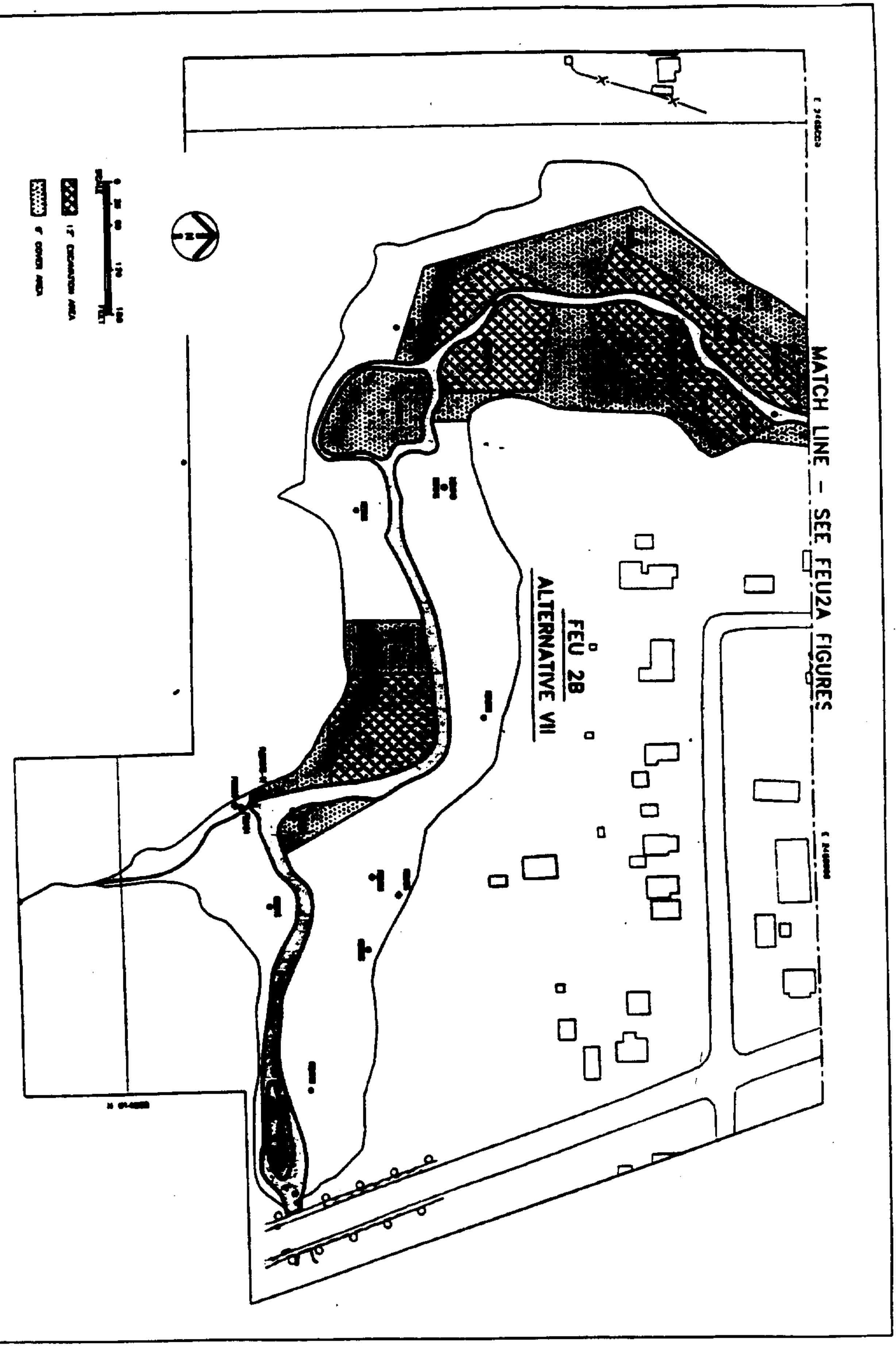

Figure 4
Exposure Unit #2B
Remedial Response Areas Alternative VII
Floodplain-Wetland Area Proposed Remedial Response Area

Figure 5: FEU 3 Response Areas

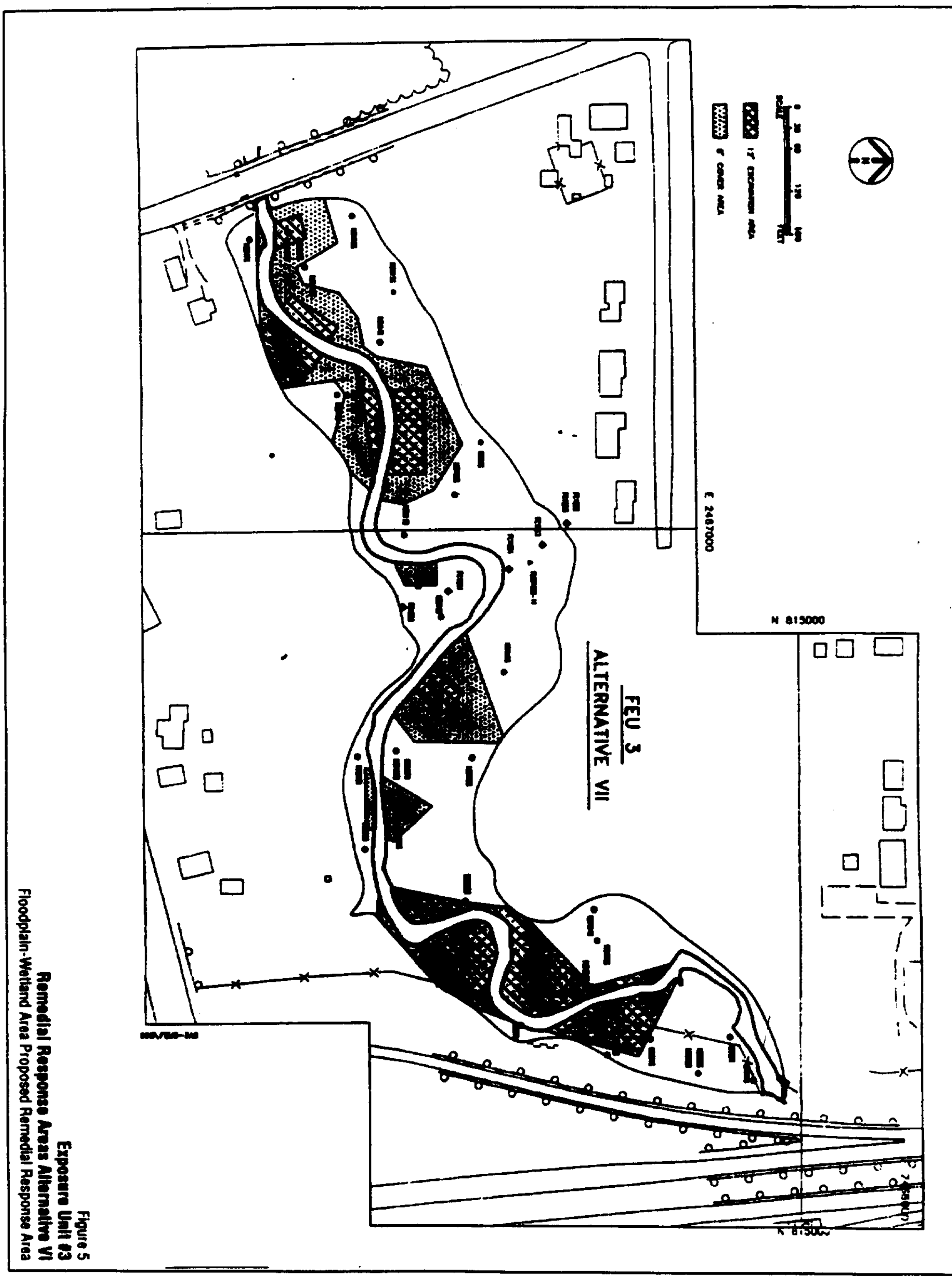

Figure 5
Remedial Response Areas
Exposure Unit #3
Alternative VI
Floodplain-Wetland Area Proposed Remedial Response Area

Figure 6: FEU 4 Response Areas

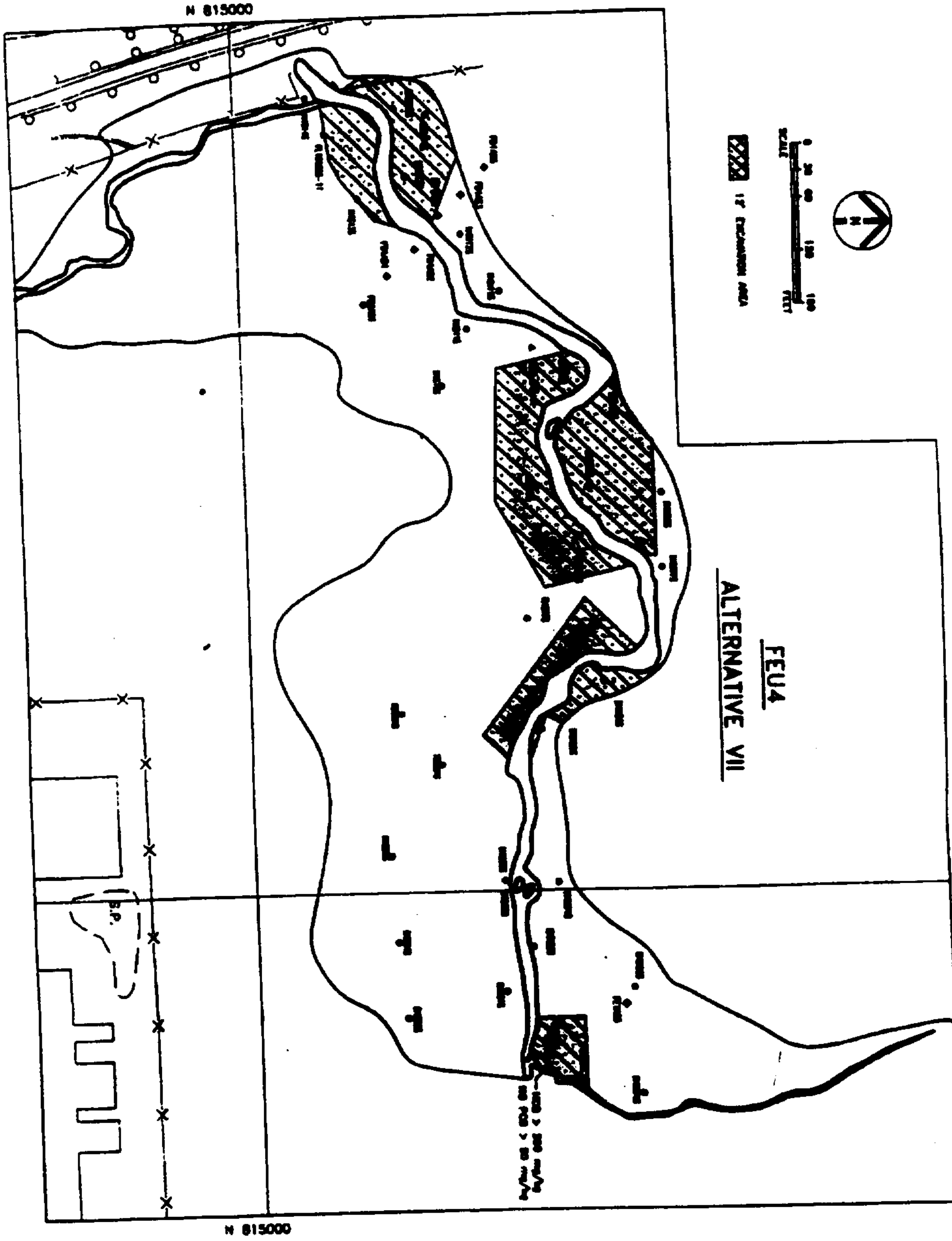

Figure 6
Floodplain Exposure Unit #4
Remedial Response Areas Alternative VII
Floodplain-Wetland Area Proposed Remedial Response Area

Figure 7: FEU 6 Response Areas

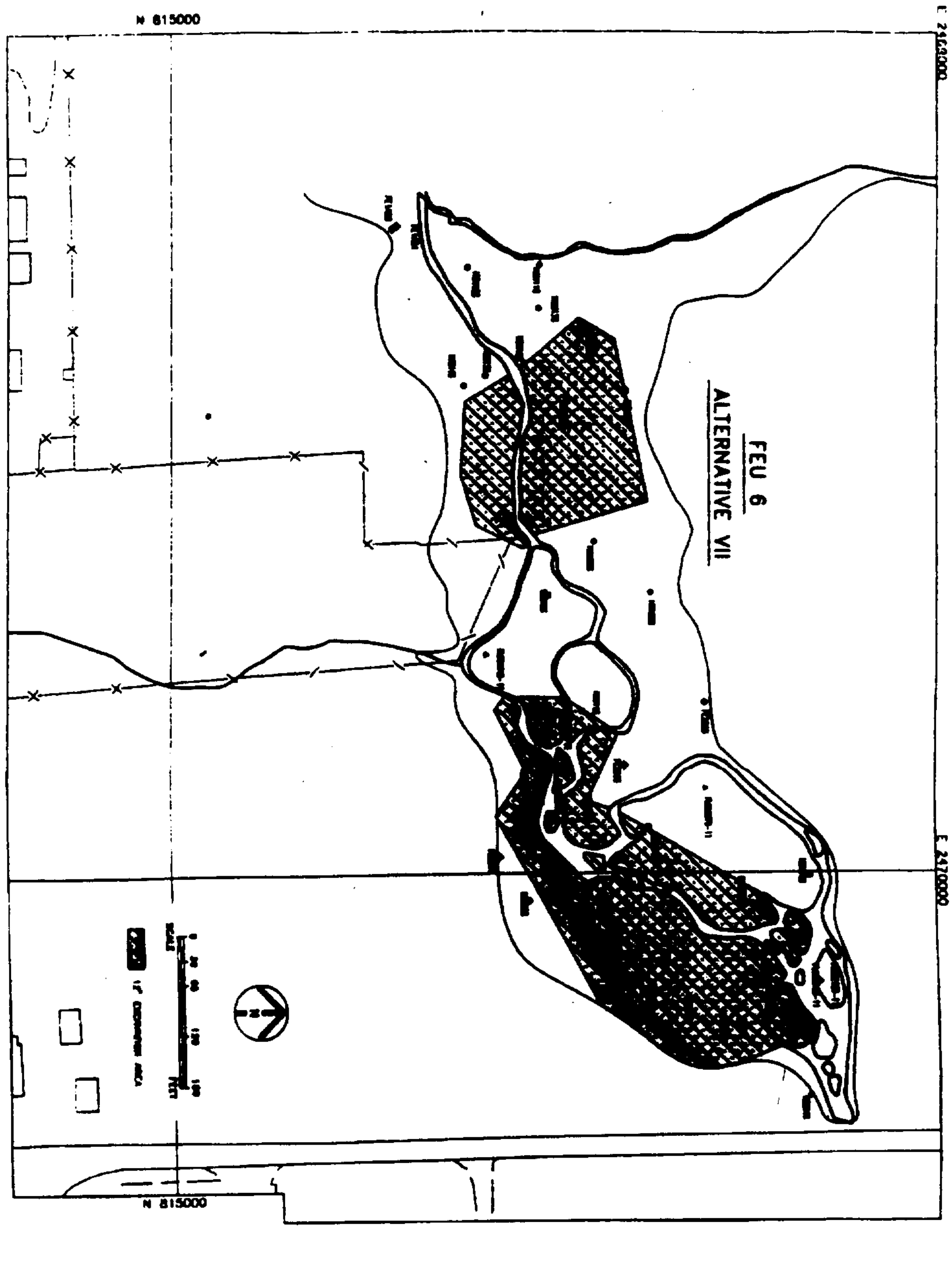

Figure 7
Floodplain Exposure Unit #6
Remedial Response Areas Alternative VII
Floodplain-Wetland Area Proposed Remedial Response Area

Figure 8: FEU 8 Response Areas

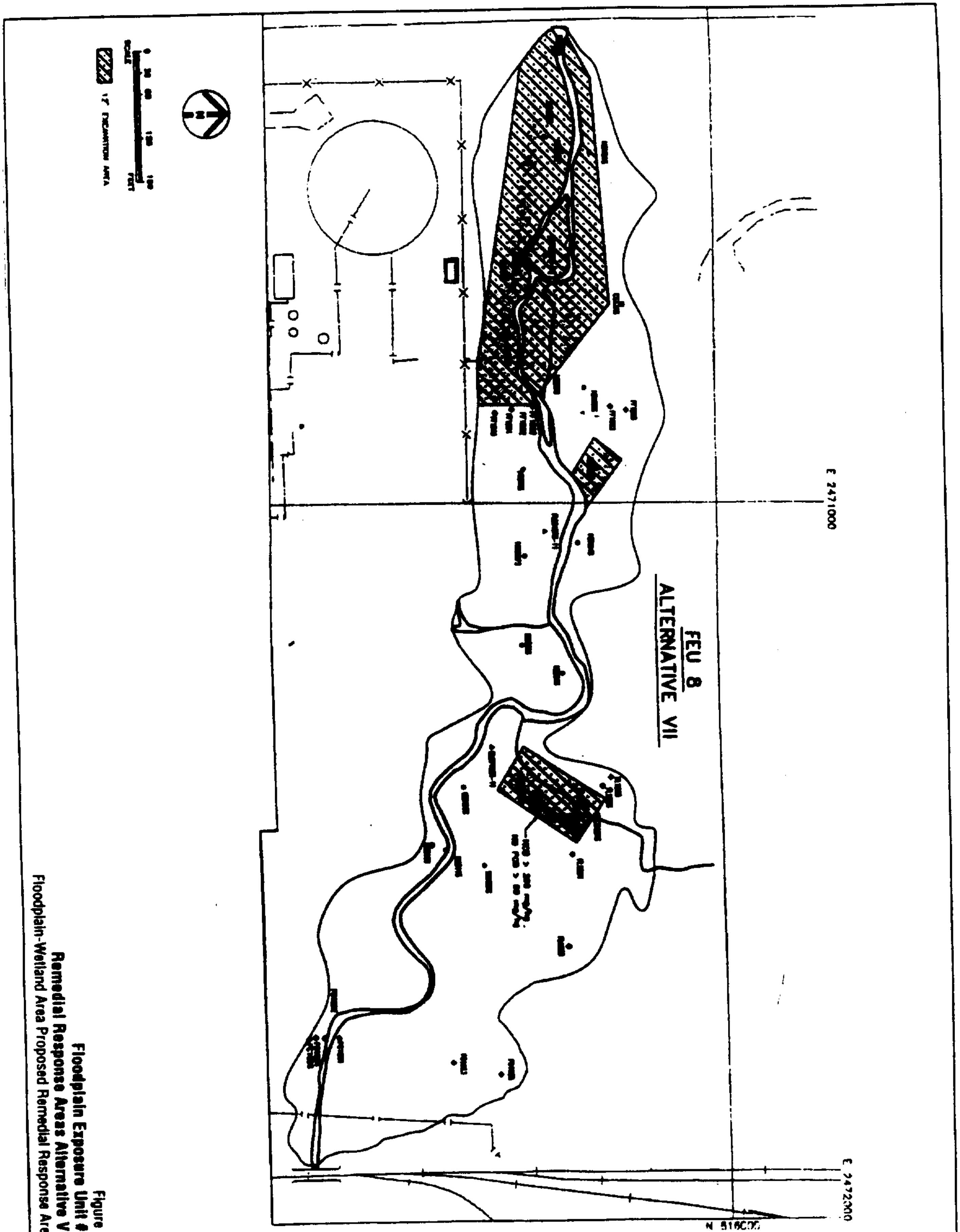

Figure 8
Floodplain Exposure Unit #8
Remedial Response Areas Alternative VII
Floodplain-Wetland Area Proposed Remedial Response Area

FIELDS BROOK
PROPOSED ON-SITE CONSOLIDATION AREA
CROSS-SECTIONAL VIEW

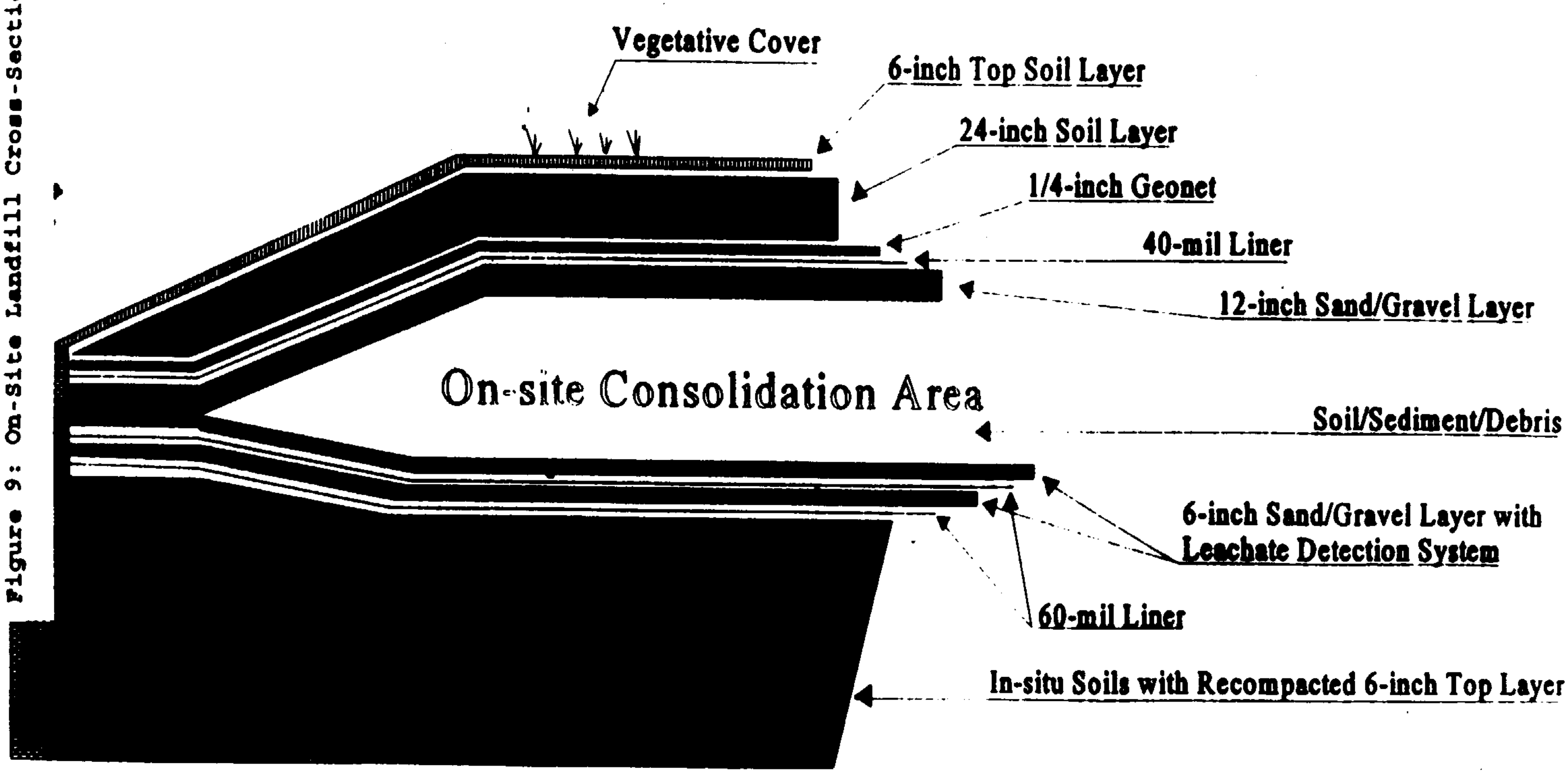

Figure 9: On-Site Landfill Cross-Section

Table 1-1: Summary of Soils Data for FEU 2

Summary of Phase I, II, and III Data For
Fields Brook FWA Surface Soils
Flood Plain Exposure Unit 2

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
1,1,2,2-Tetrachloroethane	13	39	33.33	0.58	0.025	0.092	0.019
1,1,2-Trichloroethane	2	39	5.13	0.0060	0.031	0.15	0.015
1,2,4-Trichlorobenzene	14	39	35.90	1.1	0.31	0.26	0.42
1,2-Dichlorobenzene	5	39	12.82	0.38	0.24	0.075	0.28
1,2-Dichloroethene (total)	9	39	23.08	0.21	0.014	0.034	0.014
1,3-Dichlorobenzene	12	39	30.77	3.2	0.32	0.50	0.48
1,4-Dichlorobenzene	9	39	23.08	0.36	0.25	0.16	0.34
2-Butanone	21	39	53.85	0.054	0.034	0.15	0.020
2-Hexanone	1	39	2.56	0.0020	0.032	0.15	0.015
2-Methylnaphthalene	29	39	74.36	1.2	0.16	0.21	0.29
2-Methylphenol	1	39	2.56	0.026	0.27	0.15	0.32
4,4'-DDT	7	39	17.95	0.12	0.11	0.37	0.25
Acenaphthene	6	39	15.38	0.070	0.25	0.17	0.46
Acenaphthylene	13	39	33.33	0.13	0.21	0.19	0.59
Acetone	23	39	58.97	8.1	0.24	1.3	0.097
Anthracene	21	39	53.85	0.15	0.17	0.20	0.35
Aroclor-1248	36	39	92.31	360	24	60	565
Aroclor-1254	3	39	7.69	0.22	2.03	3.8	12
Aroclor-1260	1	39	2.56	0.21	2.03	3.8	15
Benzo(a)anthracene	31	39	79.49	0.82	0.22	0.16	0.30
Benzo(a)pyrene	33	39	84.62	0.60	0.21	0.13	0.33
Benzo(b)fluoranthene	38	39	97.44	1.7	0.47	0.36	0.88
Benzo(g,h,i)perylene	17	39	43.59	0.64	0.20	0.11	0.28
Benzo(k)fluoranthene	2	39	5.13	0.67	0.29	0.16	0.31
Butylbenzylphthalate	13	39	33.33	0.14	0.21	0.19	0.47
Carbazole	7	37	18.92	0.12	0.24	0.17	0.42
Carbon Disulfide	1	39	2.56	0.010	0.032	0.15	0.015
Chlorobenzene	5	39	12.82	0.023	0.032	0.15	0.019
Chloroform	2	39	5.13	1.7	0.051	0.27	0.018
Chrysene	37	39	94.87	0.61	0.21	0.15	0.33
Di-n-butylphthalate	14	39	35.90	0.19	0.21	0.19	0.37
Di-n-octylphthalate	1	39	2.56	0.0060	0.27	0.15	0.38
Dibenz(a,h)anthracene	2	39	5.13	0.18	0.25	0.055	0.28
Dibenzofuran	13	39	33.33	0.46	0.20	0.12	0.49
Dieldrin	8	38	21.05	0.067	0.12	0.38	0.28
Diethylphthalate	6	39	15.38	0.024	0.24	0.17	0.63
Dimethylphthalate	5	39	12.82	0.090	0.25	0.16	0.36
Endosulfan I	10	39	25.64	0.038	0.06	0.19	0.15
Endosulfan II	1	39	2.56	0.10	0.11	0.37	0.22
Endosulfan sulfate	5	39	12.82	0.043	0.11	0.37	0.21
Endrin	4	39	10.26	0.065	0.11	0.37	0.25
Endrin ketone	6	39	15.38	0.027	0.11	0.37	0.20

Table 1-1: Summary of Soils Data for FEU 2 (continued)

Flood Plain Exposure Unit 2

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
Ethyl Benzene	5	39	12.82	0.0030	0.031	0.15	0.017
Fluoranthene	38	39	97.44	1.2	0.32	0.25	0.50
Fluorene	7	39	17.95	0.076	0.24	0.17	0.43
Heptachlor	3	39	7.69	1.5	0.16	0.33	1.7
Heptachlor epoxide	7	39	17.95	0.015	0.14	0.65	0.19
Hexachlorobenzene	33	39	84.62	97	14	22	303
Hexachlorobutadiene	26	39	66.67	6.30	0.81	1.2	1.4
Hexachloroethane	8	39	20.51	0.30	0.25	0.16	0.29
Indeno(1,2,3-c,d)pyrene	24	39	61.54	0.76	0.20	0.14	0.30
Methoxychlor	3	39	7.69	0.079	0.57	1.9	0.98
Methylene Chloride	21	38	55.26	7.1	0.20	1.1	0.044
Naphthalene	27	39	69.23	0.74	0.14	0.15	0.28
Phenanthrene	37	39	94.87	1.1	0.25	0.24	0.42
Phenol	1	39	2.56	0.051	0.28	0.15	0.31
Pyrene	38	39	97.44	1.1	0.30	0.26	0.48
Styrene	11	39	28.21	0.062	0.0070	0.010	0.012
Tetrachloroethene	24	39	61.54	2.5	0.077	0.40	0.053
Toluene	32	39	82.05	0.28	0.027	0.051	0.088
Total PCBs	38	39	97.44	360	24	60	284
Trichloroethene	18	39	46.15	6.8	0.19	1.1	0.068
Vinyl Chloride	1	39	2.56	0.0050	0.032	0.15	0.015
Xylenes (total)	22	39	56.41	0.62	0.021	0.10	0.015
alpha-BHC	3	39	7.69	0.061	0.060	0.19	0.14
alpha-Chlordane	3	39	7.69	0.0059	0.057	0.19	0.097
beta-BHC	19	39	48.72	4.4	0.27	0.95	0.53
bis(2-Ethylhexyl)phthalate	37	39	94.87	16	1.5	2.7	4.0
delta-BHC	13	39	33.33	2.8	0.13	0.45	0.53
gamma-BHC (Lindane)	14	39	35.90	0.47	0.090	0.20	0.56
gamma-Chlordane	12	39	30.77	0.15	0.13	0.55	0.42
Aluminum	39	39	100	23800	14562	3965	15928
Antimony	1	39	2.56	1.2	5.4	1.6	6.7
Arsenic	25	39	64.10	40	15	10	19
Barium	39	39	100	16500	3877	5179	19215
Beryllium	26	39	66.67	1.8	0.67	0.47	1.4
Cadmium	28	39	71.79	11	3.8	3.3	8.4
Calcium	39	39	100	59300	16368	14764	24357
Chromium	39	39	100	517	104	111	150
Cobalt	39	39	100	36	17	6.6	19
Copper	39	39	100	103	50	20	57
Cyanide	13	17	76.47	0.58	0.23	0.14	0.40
Iron	39	39	100	65600	37608	8198	39695
Lead	39	39	100	147	66	26	75

Table 1-1: Summary of Soils Data for FEU 2 (continued)

Flood Plain Exposure Unit 2

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
Magnesium	39	39	100	16200	5106	2337	5610
Manganese	39	39	100	2630	868	530	1004
Mercury	39	39	100	11	3.2	3.3	17
Nickel	39	39	100	157	67	36	82
Potassium	39	39	100	3170	1846	550	2029
Selenium	8	39	20.51	9.6	4.3	3.3	12
Silver	22	39	56.41	13	3.5	3.4	5.5
Sodium	24	39	61.54	1350	320	254	398
Thallium	6	39	15.38	1.3	3.5	2.7	8.5
Vanadium	39	39	100	902	149	189	226
Zinc	39	39	100	297	182	66	206

Table 1-2: Summary of Soils Data for FEU 3

Summary of Phase I, II and III Data For Fields Brook FWA Surface Soils Floodplain Exposure Unit 3

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
1,1,1-Trichloroethane	2	41	4.88	0.0030	0.0076	0.0047	0.0082
1,1,2,2-Tetrachloroethane	10	41	24.39	0.22	0.013	0.034	0.013
1,1,2-Trichloroethane	2	41	4.88	0.0060	0.0069	0.0014	0.0077
1,2,4-Trichlorobenzene	9	41	21.95	0.98	0.41	1.1	0.43
1,2-Dichlorobenzene	1	41	2.44	0.19	0.40	1.1	0.35
1,2-Dichloroethene (total)	11	41	26.83	0.041	0.0094	0.0079	0.011
1,3-Dichlorobenzene	3	41	7.32	4.2	0.49	1.2	0.45
1,4-Dichlorobenzene	2	41	4.88	0.87	0.41	1.1	0.37
2-Butanone	23	41	56.10	0.066	0.0080	0.010	0.0087
2-Methylnaphthalene	4	41	9.76	0.080	0.38	1.1	0.40
4,4'-DDT	1	6	16.67	0.080	0.025	0.034	4.1
4-Methyl-2-pentanone	2	41	4.88	0.0020	0.0075	0.0047	0.0088
Acenaphthylene	1	41	2.44	0.0050	0.40	1.1	0.43
Acetone	28	41	68.29	2.5	0.12	0.40	0.11
Anthracene	1	41	2.44	0.0060	0.40	1.1	0.42
Aroclor-1248	31	41	75.61	530	29	92	539
Aroclor-1254	1	41	2.44	0.048	2.2	6.5	6.2
Benzene	2	41	4.88	0.0020	0.0068	0.0016	0.0084
Benzo(a)anthracene	5	41	12.20	0.17	0.39	1.1	0.36
Benzo(a)pyrene	22	41	53.66	0.33	0.32	1.1	0.32
Benzo(b)fluoranthene	27	41	65.85	0.67	0.37	1.1	0.38
Benzo(g,h,i)perylene	9	41	21.95	0.14	0.36	1.1	0.34
Butylbenzylphthalate	6	41	14.63	0.041	0.37	1.1	0.43
Carbon Disulfide	3	41	7.32	0.037	0.0082	0.0066	0.0090
Carbon Tetrachloride	1	41	2.44	0.0030	0.0077	0.0046	0.0082
Chlorobenzene	4	41	9.76	0.10	0.0092	0.014	0.0093
Chloroform	15	41	36.59	0.023	0.0072	0.0056	0.0085
Chrysene	13	41	31.71	0.24	0.36	1.1	0.43
Di-n-butylphthalate	18	41	43.90	0.071	0.32	1.1	0.34
Dibenzofuran	1	41	2.44	0.0040	0.40	1.1	0.44
Ethyl Benzene	7	41	17.07	0.011	0.0070	0.0051	0.011
Fluoranthene	32	41	78.05	0.30	0.30	1.1	0.36
Fluorene	1	41	2.44	0.0030	0.40	1.1	0.46
Hexachlorobenzene	24	41	58.54	99	6.4	18	14
Hexachlorobutadiene	14	41	34.15	47	2.8	9.5	1.9
Hexachloroethane	4	41	9.76	2.0	0.43	1.1	0.40
Indeno(1,2,3-c,d)pyrene	11	41	26.83	0.16	0.35	1.1	0.34
Methylene Chloride	35	41	85.37	0.37	0.06	0.079	0.094
Naphthalene	3	41	7.32	0.055	0.39	1.1	0.43
Phenanthrene	23	41	56.10	0.24	0.31	1.1	0.34
Pyrene	30	41	73.17	0.25	0.29	1.1	0.29
Styrene	10	41	24.39	0.0030	0.0055	0.0026	0.0088

Table 1-2: Summary of Soils Data for FEU 3 (continued)

Floodplain Exposure Unit 3

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
Tetrachloroethene	28	41	68.29	0.64	0.052	0.12	0.092
Toluene	35	40	87.50	0.047	0.0047	0.0079	0.0060
Total PCBs	31	41	75.61	530	29	92	473
Trichloroethene	20	41	48.78	0.19	0.028	0.047	0.043
Xylenes (total)	32	41	78.05	0.050	0.006	0.00839	0.0080
beta-BHC	3	6	50.00	0.24	0.045	0.10	9.3
bis(2-Ethylhexyl)phthalate	31	41	75.61	9.6	0.60	1.6	1.2
Aluminum	41	41	100.00	24200	15231	3758	16392
Arsenic	25	41	60.98	24	13	7.1	16
Barium	41	41	100.00	21500	1234	3433	1855
Beryllium	32	41	78.05	1.7	0.64	0.33	0.95
Cadmium	11	41	26.83	9.7	1.7	2.4	2.3
Calcium	41	41	100.00	23500	4983	5311	7677
Chromium	41	41	100.00	470	61	90	71
Cobalt	41	41	100.00	40	14	4.6	14
Copper	41	41	100.00	79	27	14	31
Cyanide	5	6	83.33	0.32	0.18	0.085	0.33
Iron	41	41	100.00	50400	31098	5439	32450
Lead	41	41	100.00	97	44	19	49
Magnesium	41	41	100.00	8620	3977	1080	4259
Manganese	41	41	100.00	951	546	195	630
Mercury	40	41	97.56	9.2	1.1	1.8	2.1
Nickel	41	41	100.00	147	42	31	48
Potassium	41	41	100.00	3040	1797	527	1976
Silver	11	41	26.83	12	2.2	2.7	2.8
Sodium	35	41	85.37	484	200	81	222
Thallium	1	41	2.44	0.62	4.7	1.9	8.7
Vanadium	41	41	100.00	842	92	154	106
Zinc	39	41	95.12	621	135	105	152

Table 1-3: Summary of Soils Data for FEU 4

Summary of Phase I, II, and III Data For
Fields Brook FWA Surface Soils
Flood Plain Exposure Unit 4

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
1,1,2,2-Tetrachloroethane	19	36	53	15	0.67	2.5	1.5
1,1,2-Trichloroethane	6	36	17	0.0040	0.18	0.36	0.52
1,1-Dichloroethene	2	36	6	0.11	0.16	0.34	0.32
1,2,4-Trichlorobenzene	17	36	47	3.5	0.96	2.0	1.7
1,2-Dichlorobenzene	1	36	3	0.04	1.0	2.3	1.1
1,2-Dichloroethene (total)	22	36	61	9.1	0.40	1.5	0.72
1,3-Dichlorobenzene	13	36	36	3.0	0.88	1.9	1.0
1,4-Dichlorobenzene	6	36	17	0.36	0.99	2.3	1.2
2-Butanone	23	36	64	2.4	0.24	0.53	0.54
2-Hexanone	1	36	3	0.0020	0.18	0.36	0.41
2-Methylnaphthalene	17	36	47	0.045	0.89	2.3	2.4
2-Methylphenol	1	36	3	0.031	1.0	2.3	1.1
4,4'-DDT	1	7	14	0.011	0.048	0.094	1.0
4-Methylphenol	3	36	8	0.21	1.0	2.3	1.1
Acenaphthylene	10	36	28	0.033	0.95	2.3	4.8
Acetone	20	36	56	2.7	0.30	0.61	0.74
Anthracene	17	36	47	0.11	0.90	2.3	2.8
Aroclor-1248	34	36	94	560	63	133	3168
Aroclor-1254	3	36	8	0.27	4.5	9.2	35
Aroclor-1260	1	36	3	0.53	4.5	9.2	45
Benzene	1	36	3	0.041	0.16	0.34	0.26
Benzo(a)anthracene	26	36	72	0.31	0.90	2.3	1.2
Benzo(a)pyrene	24	36	67	0.37	0.93	2.3	1.1
Benzo(b)fluoranthene	31	36	86	1.6	0.63	1.4	0.91
Benzo(g,h,i)perylene	17	36	47	0.22	0.94	2.3	1.2
Benzo(k)fluoranthene	9	36	25	0.38	0.98	2.3	1.2
Butylbenzylphthalate	6	36	17	0.094	0.98	2.3	1.8
Carbazole	5	35	14	0.084	1.0	2.3	2.0
Carbon Disulfide	5	35	14	0.01	0.19	0.36	0.58
Carbon Tetrachloride	1	36	3	0.0010	0.18	0.36	0.44
Chlorobenzene	7	36	19	0.032	0.18	0.36	0.51
Chloroform	10	36	28	2.1	0.23	0.54	0.55
Chrysene	28	36	78	0.33	0.90	2.3	1.1
Di-n-butylphthalate	17	36	47	1.1	1.0	2.3	2.0
Dibenz(a,h)anthracene	1	36	3	0.038	1.0	2.3	1.1
Dibenzofuran	5	36	14	0.013	0.98	2.3	2.4
Diethylphthalate	6	36	17	0.090	0.98	2.3	2.2
Dimethylphthalate	5	36	14	0.23	0.99	2.3	1.2
Ethyl Benzene	1	36	3	0.0010	0.18	0.36	0.44
Fluoranthene	33	36	92	1.1	0.69	1.9	0.75
Fluorene	7	36	19	0.061	0.96	2.3	2.2
Hexachlorobenzene	29	36	81	230	29	46	565

Table 1-3: Summary of Soils Data for FEU 4 (continued)

Flood Plain Exposure Unit 4

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
Hexachlorobutadiene	27	36	75	190	9.2	32	25
Hexachloroethane	7	36	19	5.9	0.95	2.1	1.0
Indeno(1,2,3-c,d)pyrene	17	36	47	0.26	0.94	2.3	1.1
Methylene Chloride	27	36	75	2.2	0.23	0.53	0.45
Naphthalene	14	36	39	0.031	0.92	2.3	3.8
Phenanthrene	32	36	89	0.72	0.60	1.8	0.65
Pyrene	30	36	83	1.1	0.67	1.9	0.72
Styrene	8	36	22	0.10	0.13	0.30	0.31
Tetrachloroethene	26	36	72	38	1.5	6.3	7.9
Toluene	23	36	64	0.22	0.072	0.20	0.11
Total PCBs	34	36	94	560	63	133	2188
Trichloroethene	26	36	72	8.6	0.46	1.5	1.6
Xylenes (total)	22	36	61	3.9	0.18	0.68	0.21
bis(2-Ethylhexyl)phthalate	36	36	100	15	1.6	3.0	5.0
Aluminum	36	36	100	43400	18565	6879	20368
Arsenic	16	36	44	38	13	9.1	16
Barium	36	36	100	11000	2452	2666	6983
Beryllium	20	36	56	6.4	0.99	1.0	1.1
Cadmium	24	36	67	20.60	3.8	4.3	8.0
Calcium	33	33	100	40600	13554	11668	23330
Chromium	36	36	100	620	123	144	186
Cobalt	36	36	100	69	18	10	20
Copper	36	36	100	290	51	47	60
Cyanide	3	7	43	1.5	0.29	0.54	3.3
Iron	33	33	100	62300	38882	8859	41685
Lead	36	36	100	161	60	27	69
Magnesium	33	33	100	7420	4070	949	4360
Manganese	36	36	100	2720	825	493	1001
Mercury	32	33	97	19	3.9	4.3	15
Nickel	36	36	100	199	65	48	82
Potassium	32	33	97	3220	1864	595	2103
Selenium	2	36	6	2.7	6.3	3.2	15
Silver	16	36	44	9.4	2.6	2.4	3.9
Sodium	27	33	82	895	376	175	442
Thallium	2	36	6	0.98	6.3	4.9	14
Vanadium	36	36	100	949	192	231	306
Zinc	31	36	86	621	158	97	191

Table 1-4: Summary of Soils Data for FEU 6

Summary of Phase I, II, and III Data For
Fields Brook FWA Surface Soils
Flood Plain Exposure Unit 6

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
1,1,2,2-Tetrachloroethane	23	40	58	7.2	0.48	1.3	2.1
1,1,2-Trichloroethane	12	40	30	0.13	0.13	0.30	0.23
1,1-Dichloroethene	9	40	23	0.84	0.13	0.27	0.25
1,2,4-Trichlorobenzene	24	40	60	4.3	1.3	2.9	1.8
1,2-Dichlorobenzene	15	40	38	0.52	1.1	2.9	1.4
1,2-Dichloroethene (total)	27	40	68	110	4.1	18	63
1,3-Dichlorobenzene	16	40	40	0.73	0.94	2.8	0.91
1,4-Dichlorobenzene	15	40	38	0.52	1.0	2.9	1.1
2-Butanone	12	40	30	8.7	0.40	1.4	0.59
2-Methylnaphthalene	22	40	55	0.61	1.0	2.9	2.3
2-Methylphenol	1	40	3	0.015	1.1	2.8	1.3
4,4'-DDE	2	14	14	0.47	0.86	1.4	334
4,4'-DDT	1	14	7	0.0050	0.68	1.3	110
Acenaphthene	2	40	5	0.13	1.1	2.85	1.2
Acenaphthylene	8	40	20	0.037	1.1	2.86	2.6
Acetone	30	40	75	1.9	0.26	0.50	0.60
Anthracene	13	40	33	0.34	1.1	2.9	1.8
Aroclor-1242	1	40	3	22	6.7	11	61
Aroclor-1248	33	40	83	610	74	131	1940
Aroclor-1254	1	40	3	0.27	6.6	11	53
Benzo(a)anthracene	17	40	43	1.8	1.2	2.9	1.7
Benzo(a)pyrene	29	40	73	1.4	0.94	2.8	1.2
Benzo(b)fluoranthene	36	40	90	2.2	1.1	2.8	1.9
Benzo(g,h,i)perylene	18	40	45	1.1	1.1	2.9	1.2
Benzo(k)fluoranthene	1	40	3	0.032	1.1	2.8	1.2
Butylbenzylphthalate	7	40	18	0.62	1.1	2.9	2.0
Carbazole	3	36	8	0.051	0.76	1.4	1.3
Carbon Disulfide	3	40	8	0.045	0.14	0.33	0.22
Carbon Tetrachloride	1	40	3	0.19	0.13	0.32	0.18
Chlorobenzene	6	40	15	11	0.51	1.9	0.53
Chloroform	6	40	15	0.55	0.14	0.33	0.21
Chrysene	27	40	68	3.2	1.1	2.9	1.4
Di-n-butylphthalate	13	40	33	0.23	1.1	2.9	1.6
Dibenz(a,h)anthracene	6	40	15	0.39	1.1	2.9	1.3
Dibenzofuran	7	40	18	0.10	1.1	2.9	2.1
Diethylphthalate	14	40	35	0.67	1.0	2.8	1.9
Dimethylphthalate	14	40	35	1.7	1.0	2.8	2.7
Endosulfan II	2	14	14	0.43	0.60	1.3	89
Endosulfan sulfate	1	14	7	0.19	0.58	1.3	75
Endrin ketone	1	14	7	0.034	0.57	1.3	58
Ethyl Benzene	7	40	18	0.015	0.14	0.33	0.24
Fluoranthene	34	40	85	1.8	0.95	2.8	1.2

Table 1-4: Summary of Soils Data for FEU 6 (continued)

Flood Plain Exposure Unit 6

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
Fluorene	6	40	15	0.42	1.1	2.9	1.3
Heptachlor	1	14	7	1.0	0.48	0.74	250
Hexachlorobenzene	39	40	98	320	33	72	220
Hexachlorobutadiene	32	40	80	170	11	31	46
Hexachloroethane	15	40	38	4.3	1.2	2.9	1.8
Indeno(1,2,3-c,d)pyrene	18	40	45	0.47	1.1	2.9	1.3
Methylene Chloride	29	40	73	0.45	0.12	0.26	0.22
Naphthalene	15	40	38	0.23	1.0	2.9	2.3
Phenanthrene	32	40	80	3.5	1.0	2.8	1.4
Pyrene	27	40	68	4.3	1.0	2.9	1.4
Styrene	12	40	30	0.15	0.12	0.31	0.34
Tetrachloroethene	34	40	85	89	7.0	18	648
Toluene	25	40	63	0.10	0.11	0.30	0.23
Total PCBs	34	40	85	610	76	131	1633
Trichloroethene	31	40	78	56	4.4	11	172
Vinyl Chloride	2	40	5	8.5	0.35	1.4	0.45
Xylenes (total)	23	40	58	0.44	0.09	0.26	0.16
alpha-BHC	1	14	7	0.19	0.30	0.69	48
alpha-Chlordane	1	14	7	0.018	0.29	0.69	31
beta-BHC	5	14	36	4.5	0.65	1.3	204
bis(2-Ethylhexyl)phthalate	30	40	75	11	2.3	3.6	7.1
delta-BHC	1	14	7	0.072	0.30	0.69	36
gamma-BHC (Lindane)	1	14	7	0.25	0.30	0.69	48
gamma-Chlordane	1	14	7	0.027	0.38	0.76	101
Aluminum	40	40	100	26300	14465	5105	16452
Arsenic	23	40	58	33	13	8.0	15
Barium	40	40	100	9620	2053	2422	4416
Beryllium	33	40	83	6.0	1.1	1.3	2.1
Cadmium	31	40	78	12.10	4.0	3.4	7.8
Calcium	40	40	100	128000	26193	30628	59331
Chromium	40	40	100	1080	147	213	221
Cobalt	38	40	95	29	14	5.6	16
Copper	40	40	100	116	48	25	57
Cyanide	10	14	71	0.77	0.22	0.23	0.38
Iron	40	40	100	130000	36593	19619	40425
Lead	40	40	100	231	56	39	67
Magnesium	40	40	100	8550	3556	1163	3943
Manganese	40	40	100	3070	947	668	1224
Mercury	39	40	98	22	4.2	4.5	16
Nickel	40	40	100	484	74	84	90
Potassium	36	40	90	3100	1385	756	1773
Selenium	5	40	13	3.4	4.8	3.1	13

Table 1-4: Summary of Soils Data for FEU 6 (continued)

Flood Plain Exposure Unit 6

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
Silver	24	40	60	13	2.5	2.8	3.8
Sodium	28	40	70	1410	342	244	423
Thallium	5	40	13	5.6	4.2	2.6	8.7
Vanadium	40	40	100	1780	237	354	390
Zinc	40	40	100	339	146	65	168

Table 1-5: Summary of Soils Data for FEU 8

Summary of Phase I, II, and III Data For Fields Brook FWA Surface Soils Flood Plain Exposure Unit 8

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
1,1,1-Trichloroethane	1	42	2	0.00050	0.094	0.28	0.073
1,1,2,2-Tetrachloroethane	17	42	40	12	0.66	2.2	0.67
1,1,2-Trichloroethane	2	42	5	0.034	0.095	0.28	0.068
1,1-Dichloroethane	3	42	7	0.0030	0.094	0.28	0.076
1,1-Dichloroethene	1	42	2	0.0020	0.094	0.28	0.066
1,2,4-Trichlorobenzene	18	42	43	1.3	0.50	1.0	0.72
1,2-Dichlorobenzene	12	42	29	0.19	0.46	0.99	0.55
1,2-Dichloroethene (total)	18	42	43	47	1.3	7.2	0.80
1,3-Dichlorobenzene	8	42	19	0.52	0.48	0.99	1.1
1,4-Dichlorobenzene	17	42	40	0.53	0.43	1.0	0.63
2-Butanone	15	42	36	9.0	0.38	1.6	0.16
2-Methylnaphthalene	31	42	74	0.76	0.37	1.0	0.41
4,4'-DDE	1	24	4	0.54	0.71	2.1	4.2
4,4'-DDT	1	24	4	0.0047	0.67	2.1	3.6
4-Chloro-3-methylphenol	1	42	2	0.007	0.51	0.98	0.62
4-Nitrophenol	1	42	2	0.022	1.3	2.4	1.6
Acenaphthene	17	42	40	0.092	0.41	1.0	0.75
Acenaphthylene	20	42	48	0.061	0.38	1.0	0.68
Acetone	20	42	48	7.2	0.32	1.2	0.23
Anthracene	22	42	52	0.21	0.40	1.0	0.48
Aroclor-1242	1	42	2	0.46	5.7	16	20
Aroclor-1248	31	42	74	270	30	53	399
Aroclor-1254	4	42	10	3.6	5.8	16	17
Aroclor-1260	5	42	12	9.4	6.0	16	25
Benzo(a)anthracene	28	42	67	0.85	0.47	1.0	0.53
Benzo(a)pyrene	32	42	76	0.79	0.44	1.0	0.56
Benzo(b)fluoranthene	38	42	90	1.4	0.38	0.32	0.52
Benzo(g,h,i)perylene	15	42	36	0.28	0.45	0.99	0.48
Benzo(k)fluoranthene	11	42	26	0.56	0.48	0.99	0.56
Bromoform	1	42	2	0.00030	0.094	0.28	0.077
Butylbenzylphthalate	21	42	50	0.056	0.38	1.0	0.59
Carbazole	17	39	44	0.17	0.44	1.0	0.56
Carbon Disulfide	7	42	17	0.52	0.085	0.26	0.062
Carbon Tetrachloride	3	42	7	0.01	0.094	0.28	0.071
Chlorobenzene	7	42	17	0.98	0.10	0.29	0.078
Chloroform	4	42	10	1.2	0.11	0.32	0.089
Chrysene	31	42	74	1.0	0.47	1.0	0.56
Di-n-butylphthalate	15	42	36	0.21	0.46	0.99	0.45
Dibenz(a,h)anthracene	3	42	7	0.037	0.50	0.98	0.58
Dibenzofuran	20	42	48	0.10	0.40	1.0	0.64
Dibromochloromethane	1	42	2	0.00030	0.094	0.28	0.077
Diethylphthalate	26	42	62	0.66	0.43	1.0	0.65
Dimethylphthalate	29	42	69	1.9	0.54	1.0	0.90
Ethyl Benzene	9	42	21	0.12	0.052	0.19	0.049
Fluoranthene	37	42	88	2.1	0.49	0.55	0.66
Fluorene	20	42	48	0.17	0.41	1.0	0.49
Hexachlorobenzene	35	42	83	480	30	95	132
Hexachlorobutadiene	22	42	52	17	1.2	2.8	1.9
Hexachloroethane	13	42	31	2.4	0.48	0.99	0.69

Table 1-5: Summary of Soils Data for FEU 8 (continued)

Flood Plain Exposure Unit 8

Parameter	Number Detects	Number Samples	Percent Detected (%)	Maximum Detect (mg/kg)	Arithmetic Mean (mg/kg)	Standard Deviation	95% UCLM (mg/kg)
Indeno(1,2,3-c,d)pyrene	20	42	48	0.42	0.45	0.99	0.50
Methylene Chloride	18	42	43	0.74	0.057	0.15	0.060
N-nitrosodiphenylamine	6	42	14	0.12	0.48	0.99	0.61
Naphthalene	29	42	69	0.056	0.34	1.0	0.44
Phenanthrene	36	42	86	4.6	0.63	0.87	0.92
Pyrene	38	42	90	1.9	0.47	0.52	0.64
Tetrachloroethene	23	42	55	8.2	0.49	1.8	0.46
Toluene	25	42	60	0.17	0.033	0.09	0.056
Total PCBs	33	42	79	270	34	58	238
Trichloroethene	26	42	62	11	0.78	2.4	1.6
Xylenes (total)	18	42	43	0.30	0.036	0.10	0.044
beta-BHC	7	24	29	2.4	0.51	1.1	14
bis(2-Ethylhexyl)phthalate	31	42	74	67	5.7	11	14
trans-1,3-Dichloropropene	1	42	2	0.00040	0.094	0.28	0.074
Aluminum	41	41	100	31500	17053	4933	18686
Antimony	1	42	2	21	5.8	3.2	7.8
Arsenic	28	42	67	43	15	11	19
Barium	42	42	100	1370	297	279	375
Beryllium	32	42	76	19	1.3	3.0	2.2
Cadmium	25	42	60	9.7	1.8	2.0	2.5
Calcium	42	42	100	74100	15225	15261	22286
Chromium	42	42	100	1580	266	345	466
Cobalt	42	42	100	29	14	4.9	16
Copper	42	42	100	147	49	30	59
Cyanide	21	24	88	0.66	0.23	0.13	0.29
Iron	42	42	100	58400	36702	10364	40274
Lead	42	42	100	263	62	39	71
Magnesium	42	42	100	5470	3513	947	3839
Manganese	42	42	100	12900	1418	2000	1797
Mercury	41	42	98	58	13	15	128
Nickel	42	42	100	90	44	17	51
Potassium	40	42	95	3930	1796	742	2127
Selenium	16	42	38	1.8	3.8	3.9	8.4
Silver	27	42	64	17	3.8	4.3	7.1
Sodium	19	42	45	798	274	167	342
Thallium	12	42	29	16	3.5	3.8	7.8
Vanadium	42	42	100	2280	430	584	764
Zinc	39	42	93	420	194	95	235

Table 2-1: FWA CUGs: Residential Carcinogen

Cleanup Goal Concentrations For Carcinogens In Floodplains and Wetlands Soil Based On Ingestion And Dermal Absorption By A Residential Receptor (Integrated Exposure Duration Of 30 Years)

Chemical	U.S.EPA Carcinogen Class	Slope Factor (mg/kg-day)	Source (a)	Oral Absorption Fraction	Dermal Absorption Fraction	Risk Specific Concentration at Cancer Risk Level of 1E-06 (mg/kg)
Arsenic (i)	A	1.75	IRIS	0.95	0.001	2.6
Beryllium	B2	4.3	IRIS	0.01	0.001	0.5
beta BHC	C	1.8	IRIS	0.5	0.10	0.9
gamma BHC (Lindane)	C	1.3	HEAST d	0.5	0.10	1.3
bis(2-Ethylhexyl)phthalate	B2	0.014	IRIS	0.25	0.25	43.5
Carbazole	B2	0.02	HEAST d	1	0.25	75.7
Chloroform	B2	0.0061	IRIS	1	0.05	411.6
4,4'-DDE	B2	0.34	IRIS	1	0.10	6.3
4,4'-DDT	B2	0.34	IRIS	1	0.10	6.3
1,4-Dichlorobenzene	B2	0.024	HEAST d	1	0.25	63.1
1,1-Dichloroethene	C	0.6	IRIS	1	0.05	4.2
Hexachlorobenzene	B2	1.6	IRIS	0.8	0.25	0.8
Hexachlorobutadiene	C	0.078	IRIS	1	0.25	19.4
Hexachloroethane	C	0.014	IRIS	1	0.25	108.1
Methylene chloride	B2	0.0075	IRIS	0.98	0.05	333.6
PCBs	B2	7.7	IRIS b	0.95	0.06	0.3
PAH - Benzo(a)anthracene	B2	0.73	c	0.5	0.03	3.3
PAH - Benzo(b)flouranthene	B2	0.73	c	0.5	0.03	3.3
PAH - Benzo(a)pyrene	B2	7.3	c	0.5	0.03	0.3
PAH - Chrysene	B2	0.0073	c	0.5	0.03	333.0
PAH - Dibenz(a,h)anthracene	B2	7.3	c	0.5	0.03	0.3
PAH - Indeno(1,2,3-cd)pyrene	B2	0.73	c	0.5	0.03	3.3
1,1,2,2-Tetrachloroethane	C	0.2	IRIS	0.7	0.05	11.7
Tetrachloroethene	B2	0.051	ECAO e	1	0.03	52.7
1,1,2-Trichloroethane	C	0.057	IRIS	0.81	0.05	42.4
Trichloroethene	B2	0.011	ECAO e	0.98	0.005	267.8
Vinyl chloride	A	1.9	HEAST d	1	0.05	1.3

Cleanup Goal Concentrations For Carcinogens In Floodplains and Wetlands Soil Based On Ingestion And Dermal Absorption By A Residential Receptor (Integrated Exposure Duration Of 30 Years)

EXPOSURE ASSUMPTIONS:	
Exposure setting	Residential
Receptor (child, adolescent, adult)	Integrated
Child body weight (kg)	15
Child sediment ingestion rate (mg/day)	200
Child exposure frequency (days/year)	61
Child exposure duration (years)	6
Child surface area exposed (cm2/event) (f)	1872
Adolescent body weight (kg)	35
Adolescent sediment ingestion rate (mg/day)	100
Adolescent exposure frequency (days/year)	110
Adolescent exposure duration (years)	9
Adolescent surface area exposed (cm2/event) (g)	3328
Adult body weight (kg)	70
Adult sediment ingestion rate (mg/day)	100
Adult exposure frequency (days/year)	37
Adult exposure duration	15
Adult surface area exposed (cm2/event) (h)	3492
Soil to skin adherence factor (mg/cm2)	0.20
Averaging Time (years)	70

a. Sources of Toxicity Values:
IRIS - Integrated Risk Information System. U.S. EPA
Environmental Criteria and Assessment Office (ECAO) - U.S. EPA
HEAST - Health Effects Assessment Summary Tables, U.S. EPA
b. Under review by EPA workgroup
c. Relative potency value cited in preliminary draft document - Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons, U.S. EPA Office of Health and Environmental Assessment, March, 1993.
d. Under review by CRAVE workgroup
e. Verified by workgroup, IRIS input pending weight of evidence decision.
f. Percent exposed (26% = arms, hands & feet) x 50 percentile surface area of child (age 1 thru 6 = 7200).
g. Percent exposed (26% = arms, hands & feet) x 50 percentile surface area of adolescent (age 7 thru 15 = 12800).
h. Percent exposed (18% = arms, hands & feet) x 50 percentile surface area of adult (age 16 thru 30 = 19400).
i. A bioavailability factor of 65% is used to adjust for the matrix effect of soil on gastrointestinal absorption of arsenic.

Table 2-2: FWA CUGs: Residential Non-Carcinogen

Fields Brook - Floodplains and Wetlands

Cleanup Goal Concentrations for Noncarcinogens In Floodplains and Wetlands Soil Based On Ingestion and Dermal Absorption By A Residential Receptor (Integrated Exposure Duration of 30 Years)

Chemical	Reference Dose (RfD) (mg/kg-day)	Source (a)	Oral Absorption Fraction	Dermal Absorption Fraction	Health Hazard - Specific Concentration for Hazard Quotient Set Equal to 1 (mg/kg)
Acenaphthene	0.06	IRIS	1	0.03	6.5E+04
Acetone	0.1	IRIS	1	0.05	9.7E+04
Anthracene	0.3	IRIS	0.5	0.03	3.0E+05
Arsenic (k)	0.0003	IRIS	0.95	0.001	5.9E+02
Barium	0.07	IRIS	0.06	0.001	8.6E+04
Beryllium	0.005	IRIS	0.01	0.001	5.0E+03
gamma BHC (Lindane)	0.0003	IRIS	0.5	0.10	2.0E+02
bis(2-Ethylhexyl)phthalate	0.02	IRIS	0.25	0.25	5.4E+03
2-Butanone	0.6	IRIS	1	0.05	5.8E+05
Butylbenzylphthalate	0.2	IRIS	0.9	0.25	9.6E+04
Cadmium	0.001	IRIS f	0.05	0.001	1.2E+03
Carbon disulfide	0.1	IRIS	1	0.05	9.7E+04
Chlorobenzene	0.02	IRIS	1	0.05	1.9E+04
Chloroform	0.01	IRIS	1	0.05	9.7E+03
Chromium III	1	IRIS	0.05	0.001	1.2E+06
Chromium VI	0.005	IRIS	0.1	0.001	6.2E+03
Copper	0.037	HEAST d	0.6	0.001	4.7E+04
Cyanide	0.02	IRIS g	0.72	0.001	2.6E+04
4,4'-DDT	0.0005	IRIS	0.5	0.10	3.3E+02
Dibenzofuran	0.004	ECAO	1	0.03	4.3E+03
1,2-Dichlorobenzene	0.09	IRIS	1	0.25	4.4E+04
1,3-Dichlorobenzene	0.09	DWHA	1	0.25	4.4E+04
1,1-Dichloroethane	0.1	HEAST	1	0.05	9.7E+04
1,1-Dichloroethene	0.009	IRIS b	1	0.05	8.8E+03
trans-1,2-Dichloroethene	0.02	IRIS	1	0.05	1.9E+04
Diethyl phthalate	0.8	IRIS	0.9	0.25	3.8E+05
Dimethyl phthalate	10	HEAST b	0.95	0.25	4.9E+06
Di-n-butylphthalate	0.1	IRIS b	0.9	0.25	4.8E+04
Endrin ketone	0.0003	IRIS j	1	0.10	2.3E+02
Fluoranthene	0.04	IRIS	0.5	0.03	4.0E+04
Fluorene	0.04	IRIS	1	0.03	4.3E+04
Hexachlorobenzene	0.0008	IRIS	0.8	0.25	3.7E+02
Hexachlorobutadiene	0.002	IRIS	1	0.25	9.9E+02
Hexachloroethane	0.001	IRIS	1	0.25	4.9E+02
Manganese	0.14	IRIS i	0.03	0.001	1.6E+05
Mercury (inorganic)	0.0003	HEAST c	0.15	0.001	3.8E+02
Methylene chloride	0.06	IRIS	0.98	0.05	5.8E+04
4-Methylphenol	0.005	HEAST	1	0.25	2.5E+03
Naphthalene	0.04	HEAST b	1	0.25	2.0E+04
Nickel, soluble salts	0.02	IRIS e	0.03	0.001	2.3E+04
Pyrene	0.03	IRIS	0.6	0.03	3.1E+04
Selenium	0.005	IRIS h	0.95	0.001	6.4E+03
Silver	0.005	IRIS	0.3	0.001	6.4E+03
Tetrachloroethene	0.01	IRIS	1	0.03	1.1E+04
Thallium	0.00008	HEAST	1	0.001	1.0E+02

Table 2-2: FWA CUGs: Residential Non-Carcinogen (continued)

Cleanup Goal Concentrations for Noncarcinogens In Floodplains and Wetlands Soil
Based On Ingestion and Dermal Absorption By A Residential Receptor
(Integrated Exposure Duration of 30 Years)

Chemical	Reference Dose (RfD) (mg/kg-day)	Source (a)	Oral Absorption Fraction	Dermal Absorption Fraction	Health Hazard - Specific Concentration for Hazard Quotient Set Equal to 1 (mg/kg)
Toluene	0.2	IRIS	1	0.05	1.9E+05
1,2,4-Trichlorobenzene	0.01	IRIS	0.85	0.25	4.7E+03
1,1,1-Trichloroethane	0.09	IRIS e	1	0.05	8.8E+04
1,1,2-Trichloroethane	0.004	IRIS	0.81	0.05	3.8E+03
Trichloroethene	0.006	ECAO	0.98	0.005	7.5E+03
Vanadium	0.007	HEAST	0.3	0.001	8.9E+03
Xylenes	2	IRIS	1	0.05	1.9E+06
Zinc	0.3	IRIS	0.3	0.001	3.8E+05

EXPOSURE ASSUMPTIONS:

Exposure setting Receptor (child, adolescent, adult)	Residential Integrated
Child body weight (kg)	15
Child sediment ingestion rate (mg/day)	200
Child exposure frequency (days/year)	61
Child exposure duration (years)	6
Child surface area exposed (cm2/event) (g)	1872
Adolescent body weight (kg)	35
Adolescent sediment ingestion rate (mg/day)	100
Adolescent exposure frequency (days/year)	110
Adolescent exposure duration	9
Adolescent surface area exposed (cm2/event) (h)	3328
Adult body weight (kg)	70
Adult sediment ingestion rate (mg/day)	100
Adult exposure frequency (days/year)	37
Adult exposure duration	15
Adult surface area exposed (cm2/event) (i)	3492
Soil to skin adherence factor (mg/cm2)	0.20
Target hazard quotient	1
Averaging Time (years)	30

a. Sources of Toxicity Values:
   IRIS - Integrated Risk Information System. U.S. EPA
   HEAST - Health Effects Assessment Summary Tables, U.S. EPA
   ECAO - Provisional RfD: Memo from Joan Dollarhide ECAO, April 1992
   DWHA - Drinking Water Health Advisory, U.S. EPA
b. Under review by EPA workgroup
c. Verified by workgroup, IRIS input pending
d. The RfD was calculated from proposed drinking water standard of 1.3 mg/l assuming 2 liters consumed per day for 70 years.
e. The oral RfD is being reconsidered by the RfD Workgroup.
f. RfD for cadmium in food.
g. Percent exposed (26% = arms, hands & feet) x 50 percentile surface area of child (age 1 thru 6 = 7200).
h. Percent exposed (26% = arms, hands & feet) x 50 percentile surface area of adolescent (age 7 thru 15 = 12800).
i. Percent exposed (18% = arms, hands & feet) x 50 percentile surface area of adult (age 16 thru 30 = 19400).
j. RfD for endrin used as surrogate toxicity value.
k. A bioavailability factor of 65% is used to adjust for the matrix effect of soil on gastrointestinal absorption of arsenic.

Table 2-3: FWA CUGs: Industrial Carcinogen

Cleanup Goal Concentrations For Carcinogens In Floodplains and Wetlands Soil
Based On Ingestion And Dermal Absorption By An Occupational Receptor
(Exposure Frequency of 60 Days per Year for 25 Years)

Chemical	U.S.EPA Carcinogen Class	Slope Factor (mg/kg-day)	Source (a)	Oral Absorption Fraction	Dermal Absorption Fraction	Risk Specific Concentration at Cancer Risk Level of 1E-06 (mg/kg)
Arsenic (g)	A	1.75	IRIS	0.95	0.001	20.8
Beryllium	B2	4.3	IRIS	0.01	0.001	4.0
beta BHC	C	1.8	IRIS	0.5	0.10	7.5
gamma BHC (Lindane)	C	1.3	HEAST d	0.5	0.10	10.3
bis(2-Ethylhexyl)phthalate	B2	0.014	IRIS	0.25	0.25	349.0
Carbazole	B2	0.02	HEAST d	1	0.25	605.2
Chloroform	B2	0.0061	IRIS	1	0.05	3274.1
4,4'-DDE	B2	0.34	IRIS	1	0.10	50.5
4,4'-DDT	B2	0.34	IRIS	1	0.10	50.5
1,4-Dichlorobenzene	B2	0.024	HEAST d	1	0.25	504.4
1,1-Dichloroethene	C	0.6	IRIS	1	0.05	33.3
Hexachlorobenzene	B2	1.6	IRIS	0.8	0.25	6.7
Hexachlorobutadiene	C	0.078	IRIS	1	0.25	155.2
Hexachloroethane	C	0.014	IRIS	1	0.25	864.6
Methylene chloride	B2	0.0075	IRIS	0.98	0.05	2654.1
PCBs	B2	7.7	IRIS b	0.95	0.06	2.5
PAH - Benzo(a)anthracene	B2	0.73	c	0.5	0.03	26.5
PAH - Benzo(b)flouranthene	B2	0.73	c	0.5	0.03	26.5
PAH - Benzo(a)pyrene	B2	7.3	c	0.5	0.03	2.6
PAH - Chrysene	B2	0.0073	c	0.5	0.03	2649.8
PAH - Dibenz(a,h)anthracene	B2	7.3	c	0.5	0.03	2.6
PAH - Indeno(1,2,3-cd)pyrene	B2	0.73	c	0.5	0.03	26.5
1,1,2,2-Tetrachloroethane	C	0.2	IRIS	0.7	0.05	93.4
Tetrachloroethene	B2	0.051	ECAO e	1	0.03	418.8
1,1,2-Trichloroethane	C	0.057	IRIS	0.81	0.05	337.5
Trichloroethene	B2	0.011	ECAO e	0.98	0.01	2125.8
Vinyl chloride	A	1.9	HEAST d	1	0.05	10.5

Table 2-3: FWA CUGs: Industrial Carcinogen (continued)

**Cleanup Goal Concentrations For Carcinogens In Floodplains and Wetlands Soil
Based On Ingestion And Dermal Absorption By An Occupational Receptor
(Exposure Frequency of 60 Days per Year for 25 Years)**

EXPOSURE ASSUMPTIONS:

Exposure setting / Receptor	Occupational Adult
Child body weight (kg)	15
Child sediment ingestion rate (mg/day)	0
Child exposure frequency (days/year)	0
Child exposure duration (years)	0
Child surface area exposed (cm2/event)	0
Adolescent body weight (kg)	35
Adolescent sediment ingestion rate (mg/day)	0
Adolescent exposure frequency (days/year)	0
Adolescent exposure duration (years)	0
Adolescent surface area exposed (cm2/event)	0
Adult body weight (kg)	70
Adult sediment ingestion rate (mg/day)	50
Adult exposure frequency (days/year)	60
Adult exposure duration	25
Adult surface area exposed (cm2/event) (f)	970
Soil to skin adherence factor (mg/cm2)	0.20
Averaging Time (years)	70

a. Sources of Toxicity Values:
IRIS - Integrated Risk Information System. U.S. EPA
Environmental Criteria and Assessment Office (ECAO) - U.S. EPA
HEAST - Health Effects Assessment Summary Tables, U.S. EPA
b. Under review by EPA workgroup
c. Relative potency value cited in preliminary draft document - Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons, U.S. EPA Office of Health and Environmental Assessment, March, 1993.
d. Under review by CRAVE workgroup
e. Verified by workgroup, IRIS input pending weight of evidence decision.
f. Percent exposed (5% = hands) x 50 percentile surface area of adult (age 16 thru 30 = 19400).
g. A bioavailability factor of 65% is used to adjust for the matrix effect of soil on gastrointestinal absorption of arsenic.

Table 2-4: FWA CUGs: Industrial Non-Carcinogen

Fields Brook - Floodplains and Wetlands

Cleanup Goal Concentrations for Noncarcinogens In Floodplains and Wetlands Soil Based On Ingestion and Dermal Absorption By An Occupational Receptor (Exposure Frequency of 60 Days per Year for 25 Years)

Chemical	Reference Dose (RfD) (mg/kg-day)	Source (a)	Oral Absorption Fraction	Dermal Absorption Fraction	Health Hazard - Specific Concentration for Hazard Quotient Set Equal to 1 (mg/kg)
Acenaphthene	0.06	IRIS	1	0.03	4.6E+05
Acetone	0.1	IRIS	1	0.05	7.1E+05
Anthracene	0.3	IRIS	0.5	0.03	2.1E+06
Arsenic (i)	0.0003	IRIS	0.95	0.001	3.9E+03
Barium	0.07	IRIS	0.06	0.001	5.6E+05
Beryllium	0.005	IRIS	0.01	0.001	3.1E+04
gamma BHC (Lindane)	0.0003	IRIS	0.5	0.10	1.4E+03
bis(2-Ethylhexyl)phthalate	0.02	IRIS	0.25	0.25	3.5E+04
2-Butanone	0.6	IRIS	1	0.05	4.3E+06
Butylbenzylphthalate	0.2	IRIS	0.9	0.25	8.2E+05
Cadmium	0.001	IRIS f	0.05	0.001	7.9E+03
Carbon disulfide	0.1	IRIS	1	0.05	7.1E+05
Chlorobenzene	0.02	IRIS	1	0.05	1.4E+05
Chloroform	0.01	IRIS	1	0.05	7.1E+04
Chromium III	1	IRIS	0.05	0.001	7.9E+06
Chromium VI	0.005	IRIS	0.1	0.001	4.1E+04
Copper	0.037	HEAST d	0.6	0.001	3.1E+05
Cyanide	0.02	IRIS g	0.72	0.001	1.7E+05
4,4'-DDT	0.0005	IRIS	0.5	0.10	2.4E+03
Dibenzofuran	0.004	ECAO	1	0.03	3.1E+04
1,2-Dichlorobenzene	0.09	IRIS	1	0.25	3.9E+05
1,3-Dichlorobenzene	0.09	DWHA	1	0.25	3.9E+05
1,1-Dichloroethane	0.1	HEAST	1	0.05	7.1E+05
1,1-Dichloroethene	0.009	IRIS b	1	0.05	6.4E+04
trans-1,2-Dichloroethene	0.02	IRIS	1	0.05	1.4E+05
Diethyl phthalate	0.8	IRIS	0.9	0.25	3.3E+06
Dimethyl phthalate	10	HEAST b	0.95	0.25	4.2E+07
Di-n-butylphthalate	0.1	IRIS b	0.9	0.25	4.1E+05
Endrin ketone	0.0003	IRIS h	1	0.10	1.8E+03
Fluoranthene	0.04	IRIS	0.5	0.03	2.8E+05
Fluorene	0.04	IRIS	1	0.03	3.1E+05
Hexachlorobenzene	0.0008	IRIS	0.8	0.25	3.1E+03
Hexachlorobutadiene	0.002	IRIS	1	0.25	8.6E+03
Hexachloroethane	0.001	IRIS	1	0.25	4.3E+03
Manganese	0.14	IRIS i	0.03	0.001	1.1E+06
Mercury (inorganic)	0.0003	HEAST c	0.15	0.001	2.5E+03
Methylene chloride	0.06	IRIS	0.98	0.05	4.3E+05
4-Methylphenol	0.005	HEAST	1	0.25	2.2E+04
Naphthalene	0.04	HEAST b	1	0.25	1.7E+05
Nickel, soluble salts	0.02	IRIS e	0.03	0.001	1.5E+05
Pyrene	0.03	IRIS	0.6	0.03	2.1E+05
Selenium	0.005	IRIS h	0.95	0.001	4.2E+04
Silver	0.005	IRIS	0.3	0.001	4.2E+04
Tetrachloroethene	0.01	IRIS	1	0.03	7.6E+04
Thallium	0.00008	HEAST	1	0.001	6.8E+02

Table 2-4: FWA CUGs: Industrial Non-Carcinogen (continued)

Cleanup Goal Concentrations for Noncarcinogens In Floodplains and Wetlands Soil
Based On Ingestion and Dermal Absorption By An Occupational Receptor
(Exposure Frequency of 60 Days per Year for 25 Years)

Chemical	Reference Dose (RfD) (mg/kg-day)	Source (a)	Oral Absorption Fraction	Dermal Absorption Fraction	Health Hazard - Specific Concentration for Hazard Quotient Set Equal to 1 (mg/kg)
Toluene	0.2	IRIS	1	0.05	1.4E+06
1,2,4-Trichlorobenzene	0.01	IRIS	0.85	0.25	4.0E+04
1,1,1-Trichloroethane	0.09	IRIS e	1	0.05	6.4E+05
1,1,2-Trichloroethane	0.004	IRIS	0.81	0.05	2.7E+04
Trichloroethene	0.006	ECAO	0.98	0.005	5.0E+04
Vanadium	0.007	HEAST	0.3	0.001	5.9E+04
Xylenes	2	IRIS	1	0.05	1.4E+07
Zinc	0.3	IRIS	0.3	0.001	2.5E+06

EXPOSURE ASSUMPTIONS:

Exposure setting Receptor	Occupational Adult
Child body weight (kg)	15
Child sediment ingestion rate (mg/day)	0
Child exposure frequency (days/year)	0
Child exposure duration (years)	0
Child surface area exposed (cm2/event)	0
Adolescent body weight (kg)	35
Adolescent sediment ingestion rate (mg/day)	0
Adolescent exposure frequency (days/year)	0
Adolescent exposure duration	0
Adolescent surface area exposed (cm2/event)	0
Adult body weight (kg)	70
Adult sediment ingestion rate (mg/day)	50
Adult exposure frequency (days/year)	60
Adult exposure duration	25
Adult surface area exposed (cm2/event) (g)	970
Soil to skin adherence factor (mg/cm2)	0.20
Target hazard quotient	1
Averaging Time (years)	25

a. Sources of Toxicity Values:
   IRIS - Integrated Risk Information System. U.S. EPA
   HEAST - Health Effects Assessment Summary Tables, U.S. EPA
   ECAO - Provisional RfD: Memo from Joan Dollarhide ECAO, April 1992
   DWHA - Drinking Water Health Advisory, U.S. EPA
b. Under review by EPA workgroup
c. Verified by workgroup, IRIS input pending
d. The RfD was calculated from proposed drinking water standard of 1.3 mg/l assuming 2 liters consumed per day for 70 years.
e. The oral RfD is being reconsidered by the RfD Workgroup.
f. RfD for cadmium in food.
g. Percent exposed (5% = hands) x 50 percentile surface area of adult (age 16 thru 30 = 19400).
h. RfD for endrin used as surrogate toxicity value.
i. A bioavailability factor of 65% is used to adjust for the matrix effect of soil on gastrointestinal absorption of arsenic.

Table 3: FWA Human Health and Ecological COCs

Fields Brook FWA
Contaminants of Concern for the Fields Brook FWA Risk Assessment.

Chemical	Human Health	Ecological
Arsenic	X	X
Barium		X
Benzo(a)pyrene	X	
Beryllium	X	
Cadmium		X
Chromium		X
Hexachlorobenzene	X	X
Hexachlorobutadiene	X	X
Hexachloroethane	X	
Lead		X
Mercury		X
Polychlorinated Biphenyls	X	X
1,1,2,2-Tetrachloroethane	X	
Tetrachloroethene	X	
Trichloroethene	X	
Vanadium		X
Vinyl Chloride	X	

Table 4-1: Location-specific ARARs

Requirement

Location-Specific Laws/Requirements

FEDERAL REGULATIONS

E.O. 11988 Protection of Floodplains

1. Limits activities in floodplains. Floodplain is defined as "the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of off-shore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year." Federal agencies must evaluate the potential effects of actions taken in a floodplain and avoid adverse impacts from remedial activities [40 CFR 6.302 and Appendix A]

E.O. 11990 Protection of Wetlands

2. Minimizes adverse impacts on areas designated as wetlands. [40 CFR 6.302(a) and Appendix A]

Clean Water Act Section 404

3. Requires Federal agencies to avoid, to the extent possible, adverse impacts associated with destruction or loss of wetlands. [40 CFR 230-231; 33 CFR 320-330]

4. Prohibits discharge of dredged or filled material into waters of the U.S. without a permit. [40 CFR 230, 33 CFR 320-330]

Rivers and Harbors Act of 1899; Section 10

5. Section 10 permit required for structures or work in or affecting navigable waters. [33 USC 403, 33 CFR 320-330]

Endangered Species Act

6. Protects endangered species and threatened species and preserves their habitat. Requires coordination with federal agencies for mitigation of impacts. [16 USC 1531 et seq; 50 CFR 200, 50 CFR 402]

Fish and Wildlife Coordination Act

7. Requires coordination with federal and state agencies on activities affecting/modifying streams or rivers if the activity has a negative impact on fish or wildlife. [16 USC 661 et seq.; 40 CFR 6.302(g)]

Requirement

National Historic Preservation Act (NHPA)

8. Requires the preservation of historic properties included in or eligible for the National Register of Historic Places and to minimize harm to National Historic Landmarks. [16 USC 470 et seq.; 40 CFR 6.301(b); 36 CFR Part 63, Part 65, Part 800]

Wilderness Act

9. Limits activities within areas designed as wilderness areas or National Wildlife Refuge Systems. [16 USC 1311, 16 USC 668; 50 CFR 53, 50 CFR 27]

Wild & Scenic Rivers Act

10. Protects rivers that are designated as wild, scenic, or recreational. [16 USC 1271; 40 CFR 6.302(e)]

Clean Air Act (CAA)

Non Attainment Area Requirements

11. Requires the use of reasonably available control technology (RACT) for sources located in non-attainment areas. [CAA Title I, Subpart 2]

12. Any activity modifying a stream or river, which will have a diversion, channeling, or other action and which affects fish or wildlife must be implemented with action to protect fish or wildlife [16 U.S.C 661 et seq.]

Resource Conservation and Recovery Act (RCRA)

13. A treatment/storage/disposal (TSD) facility within a 100-year floodplain must be designed, constructed, operated, and maintained to avoid washout.

14. Landfills may not be located within vulnerable hydrogeology areas. [RCRA 3004 (o)(7)].

Table 4-1: Location-specific ARARs (continued)

Requirement	Requirement
Toxic Substances Control Act (TSCA) 15. Requires that TSCA landfills meet specified siting, design, handling, and monitoring requirements [40 CFR 761.60 and 761.75 (B)]. **STATE STATUTES AND REGULATIONS** Ohio Hazardous Waste Siting Criteria 1. A hazardous waste facility installation and operation permit shall not be approved unless it proves that the facility represents the minimum risk of all of the following: (i) Contamination of Ground and Surface Water (ii) Fires or Explosions from Treatment, Storage or Disposal Methods (iii) Accident during Transportation (iv) Impact on Public Health and Safety (v) Air Pollution (vi) Soil Contamination [ORC 3734-06 (D) (6) (d)] 2. Prohibits the following locations for treatment, storage, and disposal of acute hazardous waste: (1) within 2,000 feet of an residence, school, hospital, jail, or prison; (2) any naturally occurring wetland; (3) any flood hazard area; (4) within any state park or national park or recreation area. [ORC 3734.05 (D)(6)(g)(h)] Ohio Solid Waste Regulations 1. Specifies locations in which solid waste landfills are not to be sited. [OAC 3745-27-07 (A) (B)] Ohio Groundwater Well Regulations 1. Mandates that groundwater wells be: (1) located and maintained so as to prevent contaminants from entering a well and (2) located to be accessible for cleaning and maintenance [OAC 3745-9-04 (A) and (B)]	Ohio Hazardous Waste Management Regulations 1. Facilities where treatment, storage, or disposal of hazardous waste will be conducted is prohibited within the 100-year floodplain. [OAC, Title 3745, Chapter 54, Section 18] 2. New RCRA treatment, storage, or disposal of hazardous waste is prohibited within 61 meters of a fault displaced in Holocene time. [OAC, Title 3745, Chapter 54, Section 18] 3. Placement of noncontainerized or bulk liquid hazardous w[illegible] in salt domes, salt bed formations, underground mines, or [illegible]es is prohibited. [OAC, Title 3745, Chapter 54, Section 18]

Table 4-2: Action-specific ARARs

FEDERAL REGULATIONS

Toxic Substances Control Act (TSCA)

1. Establishes regulations to govern the storage and disposal of PCBs including PCB-contaminated soil. [40 CFR 761]

The PCB Spill Cleanup Policy, Subpart G of §40 CFR 761, applies to spills that occurred after May 4, 1987, the effective date of the policy. Subpart G is not an ARAR at the Fields Brook Site, since PCB contamination occurred before the effective date of the policy. Subpart G is instead identified as "to be considered" (TBC) guidance.

3. Specifies requirements for disposal of materials containing PCBs. [40 CFR 761.60]

4. Dredged materials that contain 50 ppm of PCBs or greater must be disposed of in an incinerator or chemical waste landfill, as specified in the regulations. [40 CFR 761.60(a)(5)]

5. Prescribes design, construction, and operation standards for TSCA landfills. [40 CFR 761.75]

Clean Air Act

National Ambient Air Quality Standards (NAAQS)

6. Establishes ambient air quality standards to protect public health and welfare. Includes National Primary and Secondary Ambient Air Quality Standards for Particulate Matter. [40 CFR 50]

Ambient Air Monitoring

7. Specifies methods for conducting ambient air monitoring. [40 CFR 53]

Clean Water Act

8. Prohibits discharge of dredged or fill material into waters of the U.S. without a permit. [40 CFR 230, 33 CFR 320-330]

National Pollutant Discharge Elimination System (NPDES)

9. Requires dischargers of pollutants from any point source into surface waters of the United States to meet certain requirements and obtain a NPDES permit. [40 CFR 122, ~~125~~ 123, and 125 are involved]

Ambient Water Quality Criteria

10. Requires EPA to publish water quality criteria for specific pollutants for the protection of human health and the protection of aquatic life. [40 CFR 131]

National Pretreatment Standards

11. Establishes general and specific standards for pollutants that are discharged to a POTW. [40 CFR 403]

Storm Water Discharge Regulations

12. Establishes permitting, sampling and analysis requirements for industries in certain categories which discharge storm water to waters of the United States. Includes storm water discharge from construction activities. [40 CFR 122]

RCRA Corrective Action Management Unit Rule

13. Provides for designation of a Corrective Action Management Unit and eases regulatory requirements for remedial actions conducted within unit boundaries. [40 CFR 260 et al]

RCRA Hazardous Waste Treatment Storage and Disposal Regulations

14. Provides regulations for the notification of hazardous waste activities, identification and listing of hazardous wastes and management of hazardous wastes by generators, transporters and operators of treatment storage and disposal facilities. [40 CFR 260 et al]. Specific RCRA TSD regulations that may need to be evaluated as potential ARARs on a case-by-case basis include:
    a) 40 CFR 268 (movement of excavated materials)
    b) 40 CFR 6, Appendix A
    c) RCRA 3003
    d) 40 CFR 262 and 263
    e) 40 CFR 170-179
    f) EPA Hazardous Waste Permit Program (promulgated in part as 40 CFR 300.440(9/22/93)).
    g) RCRA Section 3005
    h) 40 CFR 270 and 124
    i) 50 FR 45933 (11/5/85)

Table 4-2: Action-specific ARARs (continued)

Requirement

15. Specifies requirements for closure of hazardous waste management units. [40 CFR 264.117(c), 228(a) and (b), and 310(a) and (b)]

16. These regulations establish standards for design installation and maintenance of dikes around a unit in order to ensure the unit does not fail or overtop, and to remedy problems and any contamination. [40 CFR 264, 221(g) and (h), and 261.277]

RCRA Land Disposal Restrictions

17. Establishes a timetable for restriction of land disposal of hazardous wastes and treatment criteria of hazardous waste prior to land disposal. [40 CFR 268]

RCRA Solid Waste Treatment Storage and Disposal (TSD) Regulations

18. Establishes requirements for owners and operators of solid waste disposal facilities [40 CFR 258]

STATE STATUTES (OHIO REVISED CODE)

Ohio Air Emission Standards, General

1. Air emissions must be in compliance with Sec. 3704 and any rules, permits, orders, and variance issued pursuant to that section. [ORC Sec. 3704.05(A), (B), (C)].

2. Prohibits the emission of particulate matter, dust, fumes, gas, mist, smoke, vapor, or odorous substances that interfere with the comfortable enjoyment of life or property or is injurious to public health. [ORC Sec. 3734.02(D)].

3. Requires explosive gas monitoring plans for sanitary landfills and provides authority to the Director of Ohio EPA to order an owner or operator of a facility to implement an explosive gas monitoring and reporting plan. [ORC Sec. 3734.04.1(A),(C), (D), (G)]

Requirement

Ohio Water Pollution Statutes

1. Pollution of waters of the state is prohibited. [ORC Sec. 6111.04]

2. Sites with point source discharges must comply with national effluent standards. [ORC Sec. 61111.04.2]

3. Prohibits failure to comply with requirements of Sections 6111.01 to 6111.08 or any rules, permit or order issued under those sections. [ORC Sec. 6111.07]

Ohio Nuisance Statutes

1. Prohibits noxious exhalations or smells and the obstruction of waterways. [OAC 3767.13**check with Ohio EPA re. cites**]

2. Prohibition against throwing refuse, oil, or filth into lakes, streams, or drains. [OAC 3767.14**check with Ohio EPA re. cites**]

STATE REGULATIONS (OHIO ADMINISTRATIVE CODE)

Ohio Non-Point Source Regulations

1. Regulations call for the use of conservation practices to control sediment pollution of water resources. [OAC, Title 1501, Chapters 1, 3, 5]

Ohio Water Quality Standards

1. Specifies analytical methods and collection procedures for surface water discharges. [OAC 3745-1-03].

2. All surface waters of the state shall be free from:
   (a) Objectionable suspended soils,
   (b) Floating debris, oil, or scum
   (c) Materials that create a nuisance,
   (d) Toxic, harmful or lethal substances
   (e) Nutrients that create nuisance growth
   [OAC 3745-1-04]

3. Prevents degradation of surface water quality below designated use or existing water quality. [OAC 3745-1-05 (A) (B) (C)]

4. Criteria for establishing thermal and non-thermal mixing zones for point source discharges. [OAC 3745-1-06 (A) (B)]

Table 4-2: Action-specific ARARs (continued)

Requirement

Establishes water quality criteria for pollutants that do not have specific numerical or narrative criteria [OAC 3745-1-07]

Establishes water use designations for stream segments within the Ashtabula River Basin. [OAC 3745-1-14]

Establishes water use designations for stream segments within the Lake Erie Basin. [OAC 3745-1-31]

Ohio Air Quality Regulations

Prohibition of air pollution nuisances [OAC 3745-15-07 (A)]

Ambient air quality standards for total suspended particulates [OAC 3745-17-02(A) (B) (C)]

Specifies the allowable opacity for particulate emissions from stationary sources. [OAC 3745-17-07(A through D)]

Restrictions for control of fugitive dust emissions [OAC 3745-17-08(A1) (A2) (B) (D)]

Air quality standards for carbon monoxide, ozone, and non-methane hydrocarbons. [OAC 3745-21-02(A) (B) (C)].

6. Measurement methods to determine ambient air quality for carbon monoxide, ozone, and non-methane hydrocarbons. [OAC 3745-21-03(B) (C) (D)]

Prohibition of significant and avoidable deterioration of air quality [OAC 3745-21-06]

Control requirements for emissions of organic materials from stationary sources [OAC 3745-21-07(A) (B) (E) (I) (J)]

Requirements for carbon monoxide emissions from stationary sources [OAC 3745-21-08(A-E)]

10. Emission control program requirements for preparation for air pollution alerts, warnings and emergencies. [OAC 3745-25-03]

Ohio Solid Waste Regulations

1. Defines exemptions to solid waste regulations and establishes limitations on temporary storage of putrescible waste or any solid waste which causes a nuisance or health hazard [OAC 3745-27-03(B)]

2. Establishes allowable methods of solid waste disposal. [OAC 3745-27-06(A) (B) (C)]

3. Specifies the minimum technical information required as a solid waste permit to install. [OAC 3745-27-06(B) (C)]

Requirement

4. Additional siting requirements with respect to geology, water supplies, occupied properties, parklands and mine subsidence areas. [OAC 3745-27-07(D) (F) (G) (H)]

5. Construction specifications for sanitary landfills. [OAC 3745-27-08(C) (D-H)]

6. Final closure of sanitary landfill facilities [OAC 3745-27-11 (B) (G)]

7. Established when an explosive gas monitoring plan is required for solid waste landfills. [OAC 3745-27-11(A) (B) (D) (E) (M) (N)]

8. Identified parameters and schedule for explosive gas monitoring. [OAC 3745-27-12(I) (J)]

9. Requires that a detailed plan be provided to describe how any proposed filling, grading, excavating, building, drilling or mining on land where a hazardous waste facility or solid waste facility was operated will be accomplished.

10. Specifies the required post-closure care for solid waste facilities. [OAC 3745-27-14(A)]

11. Specifies general operational requirements for solid waste landfills. [OAC 3745-27-19(E)]

12. Requires the owners/operator to implement measures to attain compliance with requirements of these rules. [OAC 3745-27-19(D) (2)]

13. Includes requirements for daily cover and intermediate cover for temporarily inactive areas. [OAC 3745-27-19(F) (G)]

14. Includes requirements for the final cap system for areas at final elevations. [OAC 3745-27-19(H)]

15. Requires owners/operations to conduct a program to detect PCB waste and hazardous waste prior to disposal.[OAC 3745-27-19(L)]

16. Surface water requires to be diverted from areas where solid waste is being, or has been, deposited. [OAC 3745-27-19 (J)]

17. Requires repair of leachate outbreaks; collections and treatment of leachate on the surface of the landfill. [OAC 3745-27-19(K)]

18. Specifies certain operational and location standards for landfills accepting waste after June 1, 1994. [OAC 3745-27-20]

Table 4-2: Action-specific ARARs (continued)

Requirement

Ohio Air and Water Pollution

1. Requires that a permit to install (PTI) or plans must demonstrate best available technology (BAT) and shall not interfere with or prevent the attainment or maintenance of applicable ambient air quality standards. [OAC 3745-31-06]

Ohio Section 401 Regulations

1. Specifies substantive criteria for Section 401 water quality criteria for dredging, filling, obstructing, or altering waters of the state. [OAC 3745-32-06]

Ohio Hazardous Waste Management Regulations

Provides regulations for the notification of hazardous waste activities, identification and listing of hazardous wastes and management of hazardous wastes by generators, transporters and operators of treatment storage and disposal facilities. Specific regulations are as follows:

1. Specifies permit information required for all hazardous waste facilities. [OAC 3745-50-44(A)]
2. Specifies permit information required for all hazardous waste land disposal facilities. [OAC 3745-50-44(B)]
3. Establishes substantive permit requirements for container storage. [OAC 3745-50-44 (C) (1)]
4. Establishes substantive permit requirements for surface impoundments [OAC 3745-50-44 (C) (4)]
5. Establishes substantive permit requirements for hazardous waste surface impoundments, waste piles, land treatment units, landfills, and underground injection wells. [OAC 3745-50-44(C)(6)]
6. Establishes substantive permit requirements for hazardous waste landfills. [OAC 3745-50-44(C)(7)]
7. Establishes substantive hazardous waste permit requirements for miscellaneous units.
8. Exempts the residues of hazardous wastes from empty containers. [OAC 3745-51-07 (A) (B)]
9. Requires that waste generators determine whether the waste is hazardous. [OAC 3745-52-11(A) through (D)]

Requirement

10. Requires the use of the manifest system for hazardous waste transportation. [OAC 3745-52-20]
11. Specifies the number of manifest copies to be prepared. [OAC 3745-52-22]
12. Specifies procedures for the use of manifests. [OAC 3745-52-23]
13. Requires a generator to package hazardous waste in accordance with U.S. DOT regulations for transportation off-site. [OAC 3745-52-30]
14. Specifies labeling requirements for hazardous waste to be transported off-site. [OAC 3745-52-31]
15. Specifies marking requirements for hazardous waste to be transported off-site. [OAC 3745-52-32]
16. Requires that generators placard hazardous waste prior to off-site transportation. [OAC 3745-52-33]
17. Specifies security requirements for hazardous waste facilities. [OAC 3745-54-14(A) through (C)]
18. Specifies inspection requirements for hazardous waste facilities. [OAC 3745-54-15(A), (C)]
19. Restricts the siting of hazardous waste facilities in areas of seismic activity or floodplains.
20. Specifies design and operation standards for hazardous waste facilities. [OAC 3745-54-31]
21. Requires that hazardous waste facilities be equipped with emergency equipment. [OAC 3745-54-32(A) through (D)]
22. Requires testing of emergency equipment. [OAC 3745-54-33]
23. Requires that personnel handling hazardous waste have immediate access to an internal alarm or emergency communication device. [OAC 3745-54-34]
24. Requires that adequate aisle space be maintained at hazardous waste facilities. [OAC 3745-54-35]
25. Requires arrangements with local authorities. [OAC 3745-54-37(A) and (B)]
26. Requires that hazardous waste facilities have a contingency plan. [OAC 3745-54-52(A) through (F)]
27. Requires that contingency plans be maintained at the facility and submitted to local authorities and the Ohio EPA. [OAC 3745-54-53(A) and (B)]

Table 4-2: Action-specific ARARs (continued)

Requirement

29. Requires an emergency coordinator. [OAC 3745-54-55]

30. Specifies the procedures to be followed in the event of an emergency. [OAC 3745-54-56]

31. Establishes circumstances under which an operator of a hazardous waste facility must implement a ground water monitoring program. [OAC 3745-54-90]

32. Presents ground water monitoring and response programs required for hazardous land-based units. [OAC 3745-54-91(A)]

33. Requires compliance with permit conditions that address ground water. [OAC 3745-54-92]

34. Requires that permit specify hazardous constituents to which the ground water protection standard of 3746-54-92 applies. [OAC 3745-54-93(A) (B)]

35. Presents the methodology for determining concentration limits and alternative concentration limits. [OAC 3745-54-94(A) (B)]

36. Establishes point of compliance at vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the unit(s). [OAC 3745-54-95(A) (B)]

37. A compliance period during which the ground water protection standards apply will be required in the permit. [OAC 3745-54-96(A) (B) (C)]

38. Presents requirements for the ground water monitoring program. [OAC 3745-54-97(A) through (H)]

39. Presents requirements of ground water detection program. [OAC 3745-54-98(A-I)

40. Presents requirements of ground water compliance monitoring program.

41. Specifies closure standards for hazardous waste facilities. [OAC 3745-55-11(A) through (C)]

42. Presents the required content of closure plans. [OAC 3745-55-12(B)]

43. Requires proper decontamination or disposal of contaminated equipment, structures, and soils. [OAC 3745-55-14]

44. Specifies post-closure care requirements. [OAC 3745-55-17]

45. Presents the requirements of an adequate post-closure plan.[OAC 3745-55-18(B)]

Requirement

46. Requires that notice be given to local land authorities concerning the disposal of hazardous waste at the site, and requires a notation to the deed to the facility property. [OAC 3745-55-19(A) and (B)]

47. Containers holding hazardous waste must be maintained in good condition (no rust or structural defects). [OAC 3745-55-74]

48. Hazardous waste placed in container must not react with the container material or liner material. [OAC 3745-55-72]

49. Containers holding hazardous waste must be closed except to add or remove wastes and must not be handled in a manner that may rupture the container or cause it to leak. [OAC 3745-55-73]

50. Requires at least weekly inspections of container storage areas. [OAC 3745-55-74]

51. Requires that container storage areas have a containment system and specifies that minimum requirements of such a system. [OAC 3745-75(A-D)]

52. Presents general precautions to be taken to prevent accidental ignition or reaction of ignitable or reactive wastes that will be stored in container. [OAC 3745-55-76]

53. Presents general precautions to be taken when dealing with incompatible wastes.

54. Specifies closure requirements for containers and containment system. [OAC 3745-55-78]

55. Requires that each existing tank used to store or treat hazardous waste that does not have secondary containment be tested to assure tank integrity. [OAC 3745-55-91(A, B, D)]

56. Requires a secondary containment system for tanks and assessment to determine tank integrity. [OAC 3745-55-92(A-G)

57. Specified general operating requirements for tank systems. [OAC 3745-55-94(A, B, C)]

58. Requires inspections at least once each operating day [OAC 3745-55-95(A-D)]

59. Requires that unfit tanks be removed from use and further releases be prevented. [OAC 3745-55-96(A, B, C, F)]

Table 4-2: Action-specific ARARs (continued)

Requirement

60. Specifies closure and post-closure requirements for tank systems. [OAC 3745-55-97(A, B)]

61. Presents general precautions to be taken to prevent accidental ignition or reaction of ignitable or reactive wastes that are treated or stored in tanks. [OAC 3745-55-98]

62. Presents general precautions to be taken when dealing with potentially incompatible wastes that are stored or treated in tanks. [OAC 3745-55-99(A, B)]

63. Specifies the design and operation requirements for waste piles, includes liner system, leachate collection and removal system, wind dispersal prevention and run-on/run-off control. [OAC 3745-56-51(A-F)]

64. Waste piles must be monitored during construction or installation and operations. [OAC 3745-56-54(A, B)]

65. Specifies closure and post-closure care requirements for waste piles. [OAC-3745-56-58(A,B,C)]

66. Allows Ohio EPA the opportunity to inspect waste files during construction. [OAC 3745-56-55(A)]

67. Specifies environmental performance standards for land-based units. [OAC 3745-57-01(A) through (D)]

68. Presents design and operating requirements for landfills. [OAC 3745-57-03(A) through (D)]

69. Presents monitoring and inspection requirements for landfills. [OAC 3745-57-05(A) and (B)]

70. Specifies closure and post-closure requirements for landfills. [OAC 3745-57-10(A) and (B)]

71. Prohibits the placement of bulk or non-containerized liquid hazardous waste, or hazardous waste containing free liquids, in landfills. [OAC 3745-57-14(A) through (D)]

72. Allows Ohio EPA opportunity to inspect landfill during construction. [OAC 3745-57-17(A)]

73. Prohibits the placement of hazardous wastes FO20, FO21, FO22, FO23, FO26 and FO27 in landfills.

74. Establishes location, design, construction, operation, maintenance and closure requirements for miscellaneous units used to treat, store and dispose of hazardous wastes.

75. Prohibits the use of dilution as a substitute for treatment of restricted wastes or restricted waste residues.

Requirement

Ohio Groundwater Wells Regulations

1. Specifies minimum construction requirements for new groundwater wells. [OAC 3745-9-06(A)(B)(D), and (E)]
2. Establishes casing requirements for groundwater wells [OAC 3745-9-05(A) through (G)]
3. Establishes surface design requirements for new groundwater wells [OAC 3745-9-05-07(A) through (F)]
4. Requires the disinfection of new wells and the use of potable water for priming pumps. [OAC 3745-9-08 (A) and (C)]
5. Establishes maintenance and modification requirements for casing, pump, and wells. [OAC 3745-9-09(A) through (C), (D)(1)(E) through (G).
6. Requires that following completion of use, wells and test holes be completely filled with grout or similar material or shall be maintained in compliance with all regulations [OAC 3745-9-10(A) through (C)]

Ohio National Pollutant Discharge Elimination System

1. Requires permits for the discharge of pollutants from any point source into waters of the United States. Must meet technology-based effluent limitations and standards (either "best conventional pollutant control technology" or "best available technology economically achievable"), determined on a case-by-case basis. [OAC, Title 3745, Chapter 33]

Ohio Pre-Treatment Requirements

2. Regulates the discharge of pollutants to POTWs. [OAC Title 3745, Chapter 3]

Table 5: FWA Alternative Evaluation

Evaluation Criteria	*Alt 1.*	*Alt 2.*	*Alt. 3A*	*Alt. 3B*	*Alt. 4*	*Alt. 5*	*Alt. 6*	*Alt. 7*
Overall Protection of Health and Environment	○	◗	◗	◗	◗	●	●	●
Compliance with ARARs	NA	◗	◗	◗	◗	●	●	●
Long-term Effectiveness and Permanence	○	◗	◗	◗	◗	●	●	●
Reduction of Toxicity, Mobility, or Volume through Treatment	○	○	◗	◗	○	◗	●	◗
Short-term Effectiveness	○	●	●	●	●	●	●	●
Implementability	NA	●	●	●	●	●	●	●
Present Worth Cost (millions)	0	4.6	8.9	9.5	5.8	19.0	21.3	6.9
State Agency Acceptance								
Community Acceptance	Community acceptance of the recommended alternative will be evaluated after the public comment period.							

● Fully meets criteria ◗ Partially meets criteria ○ Does not meet criteria NA Not applicable